CDA

Overcoming Barriers

Treating Special Populations

Pathology and Medicine

JOURNAL OF THE CALIFORNIA DENTAL ASSOCIATION VOL.34 NO.6

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QUANTITATIVE RESEARCHER

QUANTITATIVE RESEARCH

OUTCOME A: BENEFICIAL

EVIDENCE-based DENTISTRY

QUANTITATIVE RESEARCH

TRANSLATIONAL RESEARCHER

CLINICAL SIGNIFICANCE

Dentist

STATISTICAL SIGNIFICANCE

Patient

OUTCOME B: ADVERSE

Oral Health of Patients

Fundamentals: Part 1 of 2

Francesco Chiappelli, PhD

OF THE CALIFORNIA DENTAL ASSOCIATION

Journal

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DEPARTMENTS

FEATURES

Alan L. Felsenfeld, DDS

Where's the Beef?

It is interesting that from time to time the movies or television will produce a saying that permeates our culture. A classic example of this would be the crusty 84-year-old, coarse-voiced Clara Peller in a television commercial in 1984 asking aloud "Where's the beef?" Some 10 years later, Cuba Gooding, Jr., in *Jerry Maguire* portrayed a professional athlete who wanted his agent to "Show me the money." In each case, the character was requesting substance to support a concept.

Medicine and dentistry began a quest many years ago to validate the treatments we offer our patients. Evidence-based medicine or dentistry has taken the approach that we need to have justification and rationale for the procedures we perform. This has not always been met with enthusiasm from our colleagues. Sometimes it is difficult to change the way we do things because of what we are taught in school, or come to believe that what we do for our patients is the correct thing to do. It works in my hands or I believe this is right, so I do it.

This and the next issue of the *Journal of the California Dental Association* will be devoted to an explanation of the concepts of evidence-based dentistry and how they apply to contemporary practice. There are articles that deal with not only the theoretical constructs that are the definition and development of evidence, but also with the implications of such evidence as modeled in the application to different phases of practice. While not a compete elaboration of all aspects of this topic, the extremely well-qualified authors show in many ways how we can all benefit from the incorporation of good evidence in self-development and management of our patients.

If we consider the American Heart Association guidelines for premedication of patients with valvular disease, the use of evidence-based directives have been around for many years. The advanced cardiac life-support algorithms are based similarly on consensus, review of the literature, and good clinical experience. Recent consensus conferences with literature reviews and meta-analysis finally have offered guidelines for treatment of patients with total joint replacement, a longstanding area of confusion for dentistry. In recent years, the treatment of patients with hypertension, as well as other medical conditions, has algorithmic medical management protocols based on research-based criteria.

Many of our colleagues fear that evidence will not support current clinical practices. There are those who believe that insurance companies will use this information to withhold payment for procedures that are performed on a regular basis. These fears deny the possibility that the evidence and research will support what we know to be clinically acceptable. As a profession, we cannot and should not try to ignore research proven truths.

Evidence-based dentistry integrates the best research findings in a specific area

This and the next issue of the *Journal of the California Dental Association* will be devoted to an explanation of the concepts of evidence-based dentistry and how they apply to contemporary practice.

We must strive continually to provide scientific validation in treating patients.

based on a hierarchal system of validity with clinical expertise and patient values allowing for a variety of treatment options for specific problems. As you will learn, evidence comes in many forms and is not intended to negate the acceptable and clinically proven management of patients.

Our profession must not only accept the concepts but also the good evidence. We must strive continually to provide scientific validation in treating patients. Many years ago we went to the state Legislature and asked that they not pass legislation that was not based on valid evidence. No junk science was and still is our mantra. What is good for our lawmakers must be applied equally to ourselves. That it "works in my hands" or that "I believe" may or may not be the best that we can offer. We must strive to confirm all that we do in our practices.

We must not fear evidence-based practice; rather we should embrace it. We want our families and ourselves to be treated by clinicians in a manner supported by good science and not by rote or anecdotal data. Would we expect less of ourselves in providing excellent care to our own patients? Let us learn together and become better doctors through that experience. CDA

Comments, letters and questions can be addressed to the editor at alan.felsenfeld@cda.org.

Evidence-based Dental Practice at a Crossroads

Evidence-based dentistry is a methodological approach to clinical practice that is directed to aid clinical decision-making. It is a system of information management, and a system of data integration that assists clinicians in the process of meshing systemic clinical expertise and the best literature evidence to enhance treatment outcomes. By emphasizing rigorous analysis of evidence from clinical research as the basis of sound dental practice while discouraging intuitive and unsystematic approaches, evidence-based dental practice promotes the systematic analysis and appraisal of the literature to determine the best treatment alternatives.

The Scottish epidemiologist Archibald Cochrane observed in the early 1970s that in order for the medical establishment to make better and more informed decisions about health care, it must have ready access to the entire corpus of the available research evidence. He noted that less than 10 percent of medical interventions were supported by objective evidence, that certain recommended interventions did more good than harm. Cochrane recognized that many of the randomized controlled trials that established statistical significance were in the medical literature, and thus practically inaccessible to the average medical practice. In 1979, he stated "… it is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials …" Within the same decade, Gene Glass proposed a novel statistical approach for combining studies of psychotherapy. In concert to Cochrane's propositions, the meta-analysis "movement" in medicine and dentistry emerged.

A new paradigm of medical and dental intervention emerged that rests on the traditional evidence required of modern clinical practice (i.e., clinical tests, medical history, observations), as well as on a critical summary of the most appropriate and pertinent research findings. This contemporary paradigm, evidence-based medical and dental practice, is grounded on the fact that the research evidence published in randomized clinical trials must undergo a rigid and stringent process of evaluation. In addition, only the "best available evidence" generated by this process ought to be used in clinical intervention for the benefit of the patient.

In the last three decades, evidence-based research in medicine and in dentistry has become established as the most cutting-edge contemporary research movement in the health sciences. It rests on the scientific method for the identification and systematic evaluation of the best available research evidence. It leads to the conscientious, explicit and judicious use of this information to supplement the clinical observa-

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Guest editor / Francesco Chiappelli, PhD, is an associate professor, Division of Oral Biology and Medicine at the University of California Los Angeles School of Dentistry.

Authors / Richard Rauth (not pictured) is a dental student and a master's degree candidate at the UCLA School of Dentistry. Arjan Banez, DMD, (not pictured) is a graduate of the University of the Philippines and was in private practice in Manila until recently. He now resides in California, where he intends to obtain a DDS degree and establish his practice. Olivia S. Cajulis, DDS, maintains a private practice in general dentistry in California, Dental Group of Sherman Oaks, Inc.

Acknowledgments / The guest editor extends a thank you to the following individuals who provided reviews for the evidence-based dentistry articles appearing in the June and July issues of the *Journal*.

Paul R. Bilosvsky, DDS
Mark Cruz, DDS
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Thomas Rauth, DDS
Trilla Sekimoto, DDS
Brad Seto, DDS
Kenneth C. Trabert, DDS
Jason Wong, DDS
Roy T. Yanase, DDS

tions and medical history evidence in order to aid the clinical decision-making process for optimizing the care of each individual patient.

Evidence-based dentistry goes beyond the routine narrative literature review, because it systematically investigates and evaluates the strength of the available evidence, and generates a consensus statement of the best available evidence of the available research. In evidence-based dental practice, the consensus statement is as essential a part in the clinical decision-making process as evidence in the form of medical exam, tests and history.

Evidence-based dental practice is a novel approach to dental care that still suffers from several confines that limit its practicality and application. The American Dental Association has stated that evidence-based dental practice is "the approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patients oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences …" This definition sounds wonderful, but is this, realistic? Additionally, is it not exactly what the dental field has provided for its patients for decades? Is evidence-based dental practice nothing new, merely a new "term" for a previously recognized and accepted system?

The collection of papers in this issue is focused to address these critical and cutting-edge questions.

Evidence-based dental practice is grounded on evidence-based research, which stringently follows the hypothesis-driven scientific process, and dwells in "research on research." The purpose of evidence-based research is to critically evaluate the methodology, design and data analysis of all available research reports in order to generate the consensus statement of the best available evidence so that clinicians can make fully informed decisions about the care of individual patients. The consensus statement is generated from the systematic review of the literature, and is supported by statistical analysis (e.g., acceptable sampling analysis, meta-analysis). Evidence-based dental practice makes use of the consensus statement obtained from the systematic and critical evaluation of all available research evidence in clinical decision-making. By contrast, the traditional model of dentistry based on the evidence relies on individual pieces of research, rather than the consensus of the best available reported research evidence. In other words, the vast majority of dentistry continues to be delivered based on the weakest levels of evidence since evidence-based dentistry is completely novel for the grass-roots clinician. It will take tremendous effort, much time, and a variety of approaches to bring evidence-based dentistry into mainstream dental practice, and the collection of papers in this issue represents one step toward that goal.

> In brief, it is important that evidence-based research evolve to incorporate all fields of dental research, and all types of research designs.

The obvious question then becomes: Is evidence-based dental practice practical? The papers in this issue of the *Journal of the California Dental Association* illustrate not only the complexity of this novel and emerging model of dental practice, but also its practicality. A great limitation posed to evidence-based dental practice is performing the research to generate the consensus statement of the best available evidence. The papers in this issue do not focus on evidence-based research methodological problems.

It has been suggested that evidence-based dental practice is presently at a crossroad: status quo ante vs. challenge. Professional dentists can be grouped in four more or less distinct groups: those who know about evidence-based dental practice, those who do it, those who want to do it, or those who try to do it. They might either continue to be where they are, or they might take the challenge to take the field to the next frontiers; these individuals are the leaders of our profession in the 21st century. They are the teachers, the future of evidence-based dental practice. Other dentists think they know about evidence-based dental practice, and state that they have been doing it always. They see nothing new in this paradigm, and argue that they have been doing "it" right all along — thus, by inference, they need not change. Unless they remain on the road of status quo, they will set up hurdles along the path of success of evidence-based dental practice. A third group of dentists state honestly they have no idea what evidence-based dental practice stands for, are talking about, but really wish not to hear about it lest they be unsettled in their ways and in their views. They may most likely take the road of status quo or at best, state their intent and take a few steps of inquiry into the road of challenge to turn around right back into the model of dental practice with which they are more familiar and comfortable. Lastly, there are those dentists who have no clue about evi-

dence-based dental practice, but want to learn because they sense that in doing so, they will best serve their patients. They seek to grow professionally and will most likely read assiduously this collection of papers. They are the *tabula rasa*, they are ready to absorb this new model. They are the future of evidence-based dental practice.

This issue of the *Journal* provides an introduction to the fundamentals of evidence-based dental practice and to how it must be distinguished from and can enrich the traditional model of dentistry based on the evidence. It does not discuss certain research challenges, which are currently addressed through other venues. For instance, the papers in this issue do not address the fundamental problem of what type of studies should or should not be included in a systematic review. Clinical trials, which are often attributed close to the highest level of evidence, ideally provide clinically relevant, practical, and statistically significant results because they rigidly rest on a design that is randomized, double-blinded, and placebo-controlled. In practical research, adequate control groups are rare, and randomization is difficult to obtain. Hence, in reality, clinical trials are often neither properly randomized nor fully controlled. Therefore, with respect to the evaluation of the study design, the commonly used consolidated standards for randomized trials ought to be re-evaluated. Furthermore, with the realization that clinical studies can often not be structured as randomized controlled trials (e.g., cancer treatment studies), but are best conducted as observational studies, new standards should be established in evidence-based research for this purpose (e.g., consolidated standards for observational studies).

In addition, research in animal studies, dental materials, and in cellular and molecular biology, while vital for the creation of new knowledge in oral biology and medicine, and for developing and testing new dental products, never follow the design of clinical trials. Case in point, restorative dentistry, the operative dental procedure that aims to replace diseased or lost tooth structure with certain materials that are biocompatible to the oral cavity. These restorative materials have an ultimate goal to restore the function as well as the appearance of the natural tooth. At present, gold and porcelain have emerged to be the most commonly used indirect inlays. Recent research breakthroughs in restorative dentistry include the use of calcium phosphate as an alternative restoration of similar effectiveness as gold and porcelain indirect inlays. The relevance of this domain of research to dental practice is unquestionable, but evidence-based research, as presently held, precludes the generation of systematic reviews and consensus statements on these different types of materials for indirect inlays. Other domains of dental research can be taken as case examples as well. For instance, fundamental research in cellular and molecular immunity has yielded profoundly new and important knowledge about the mechanisms of immune surveillance in the oral cavity in a variety of pathological processes from periodontal disease to mucositis and stomatis. The new frontier of molecular biology, which studies the regulation of what determines noncoding vs. coding DNA, is most likely at the root of the regulatory mechanisms of these immune processes.[1] Somehow, this body of evidence must be pooled and evaluated systematically to aid not only the formulation of the next generation clinical trials but also, and more directly, the understanding by the treating dentist of the fundamental processes of the pathology and the mechanism of the treatment regimen.

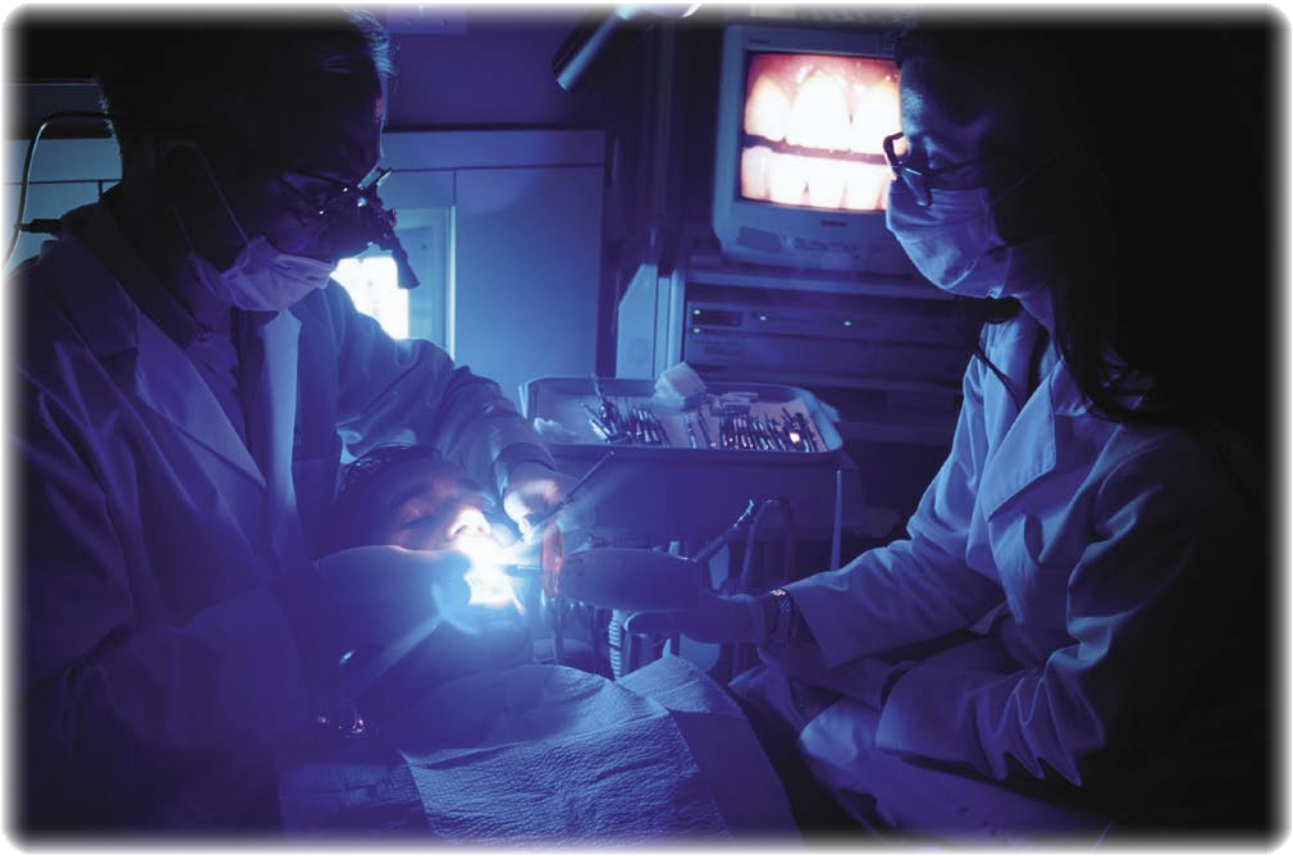
In brief, it is important that evidence-based research evolve to incorporate all fields of dental research, and all types of research designs. Often times, the outcome of a clinical trial provides the foundation for the evolution of future research in the domains of animal, materials and laboratory, and of observational clinical studies. These research issues are being actively addressed in academic circles and our professional organization.[2] In the context of this *Journal* issue however, the focus was maintained on the implications and applications of the evidence-based movement in clinical decision-making and implementation in next month's issue.

The ADA has described dentistry based on the evidence as that approach to dental practice that incorporates the elements of dentist's expertise, evidence obtained from the patient, and any relevant published report. It has contrasted that traditional approach to dental practice with evidence-based dental practice, which integrates the traditional model of dental practice based on the evidence with the "best available" research evidence.[3] This guiding the model of evidence-based dental practice postulates the urgency of improving quality of care by utilizing efficacious methods, and by controlling or minimizing the elimination of the harmful ones. This will be achieved when clinical practice guidelines will be supplemented with comprehensive and well-crafted consensus statements from systematic reviews of the research literature, and evidence-based dental practice will have become a reality. CDA

References / 1. cf., International Post-Genetics Society, Chiappelli co-founder.

2. AADR Science and information committee, Chiappelli, chair 2006-07.

3. cf., Evidence-based clinical recommendations: Professionally applied topical fluoride report of the council on scientific affairs, American Dental Association, January 2006.



Lasers: Slowly Being Accepted

By Dell Richards

In the past five years, lasers have become a more accepted part of dental practice — at least in perio work, curing, and whitening. Lasers for diagnosing and prepping cavities use are increasingly also, but their acceptance has been slower. The future holds promise for root canals and caries treatment and prevention — but the future could be a long way off.

Pamela DiTomasso, DDS, is typical of dentists who are working their way into lasers. She has three diode lasers for soft-tissue work and couldn't live without them. "That's a workhorse here," said the Sacramento dentist. "The hygienists couldn't go back to practicing without it. The improvement in the tissue as it heals is phenomenal."

"The more water you have, the better the laser does, which is the opposite of the drill."

DONALD COLUZZI, DDS

Not only do the hygienists use it constantly, the dentists also use it to replace the retraction cord when doing crowns. "We just zip around there with the laser, which stops the bleeding and allows us space to get a good impression."

The erbium laser is another story. "We are creatures of habit," said DiTomasso. "It's easier to pick up the drill. We have to make ourselves use it more."

DiTomasso has had the erbium for about a year. When she bought it, the staff took the training offered by the company. Then, the staff trained with Joel White at the University of California San Francisco School of Dentistry. "We wanted a more objective training to make sure we knew everything about laser technology in general."

That one-day lesson cost $5,000 on top of the $70,000 spent for the machine itself.

In addition, the laser is not pain-free, as is sometimes touted. "We tried it without numbing people, but they commented on it. So we just automatically numb them now."

One unexpected benefit was the patient response to the idea of lasers for cavities. "Patients like the fact that it is high-tech, something new other than the traditional drill," DiTomasso said. "There is an image factor. Patients think we are better than the other guy.

"We didn't think of the patient angle when we got it," said DiTomasso.

Rodger "Rod" Kurthy, DMD, agreed — and not just about image. A Mission Viejo dentist who has written seven books on marketing, two of which are on lasers, Kurthy is an early adopter. He had an air abrasion years ago, but developed lung problems as a result. "I woke up one morning gasping for air," Kurthy said. "On Friday, I tried to cut back but everyone kept asking for it."

Over one weekend, Kurthy dismantled it.

Knowing he had to keep up his image of providing the latest available care to his patients, Kurthy went to a nearby laser company and bought one sight unseen. "I stumbled on it that way," Kurthy said. "And it was no miracle machine."

Nonetheless, Kurthy swears by the technology. Today, he has soft- and hard-tissue lasers, as well as one to diagnose caries. He praises the diagnostic tool unabashedly — not only for prevention of larger cavities, but for the money-making aspect. "When you find these small cavities, it's wonderful for the patient," said Kurthy. "These tiny areas of decay are not going to get bigger.

"You find two little, tiny cavities not found otherwise, and you get 100 percent of your charge. Because you don't charge by the size, you charge by the surface. You charge as much as an occlusal, but knock these out on a recall."

Patients love it because the machine not only gives a reading, but beeps like a Geiger counter. "It's not just the dentist who thinks there's a cavity, there's this machine," Kurthy said. "Young patients are thrilled we found a cavity when the sound goes off. When you find cavities, nobody questions it."

Whether lasers are used for hard or soft surfaces, dentists have noticed another advantage — that they seek out diseased areas, vaporizing them and killing bacteria in the process.

Donald Coluzzi, DDS, past president of the Academy of Laser Dentistry, has noted that "… the laser has some selectivity in removing disease. It has some preference," said Coluzzi, who also is on the faculty of the School of Dentistry at UCSF.

If you set the right amount of energy, the laser won't take away as much of the healthy tooth, even for cavity prep because decay has more water. "The

great news is that the primary attractor of laser energy is water," said Coluzzi. "The more water you have, the better the laser does, which is the opposite of the drill."

Another beneficial use of lasers is in cosmetic work. To remove gum tissue, dentists often remove bone. "In removing gum tissue, we have to be careful of the supporting bone underneath," said the Portola Valley dentist.

A 2004 Japanese study that overviewed prior articles as well as running their own, found that lasers are safer and more effective than the drill on bone.

Despite the touted benefits, dentists are not jumping on the laser bandwagon. Only 5 to 7 percent of dentists worldwide have them.

Although prices have come down on some, that hasn't been the case for the high-end ones. "The disadvantage at the moment is the cost," Coluzzi said.

As a result, companies are questioning the value of continuing, even if there is a huge potential market waiting. "The companies are wondering if they should do this, especially if they can only sell four," said Coluzzi.

"The price is a really big problem in a young doctor's office," said Peter Rechmann, DDS, professor and director of Clinical Research at the UCSF Department of Preventive and Restorative Dental Sciences. "The erbium came out with a new model and raised the price, saying the tool is wonderful and you have to pay for that. The components are not that expensive, but the companies want their R&D back."

Research and development not only is expensive, but can be painfully slow. Root canals are a case in point. "We are still struggling with developing a tip to do everything we need in root canals," Coluzzi said. "The challenge is to get the laser energy out the side effectively."

One company has developed a side-firing tip, but it's not flexible. "Which then begs the question of getting it into canals that are curved. But, it's an engineering challenge, not a physics challenge."

Nonetheless, research does continue to hold out exciting new possibilities. Rechmann is working on a laser that will remove the calculus and microbial plaque without taking away healthy tooth structure. Although he has been working on it since 1985 — and saying he hopes it will be ready next year — he has no idea when it actually will be available. "I always say it will be done next year," joked Rechmann.

Also at UCSF, John Featherstone, MSc, PhD, is working on a low-energy CO2 laser that changes the enamel of the tooth to make it more caries-resistant.

"The erbium works on the water in the mineral, using another wavelength. If you run with low energy, you really change the enamel rather than ablating it," Rechmann explained.

"The idea is to get a similar effect as fluoride or an even better one with additional fluoride for adults and children."

Although efficiency studies are halfway done, dentists shouldn't expect anything coming to market for at least five years, if not longer.

Despite their promises, lasers have a long way to go. Even when dentists spring for them like DiTomasso has done, they still have to incorporate them into their daily workload. "It's an investment of your time as well as money," said DiTomasso. "It's not just plug-and-go. It's a different mindset."

While proponents sing their praises and researchers continue to find new and better uses, most dentists are taking a wait-and-see approach.

A practicing journalist, Dell Richards runs Dell Richards Publicity, a public relations firm specializing in dentistry and health care.

Treatment Costs Examined

A recent study has compared and analyzed trends, as well as the initial average costs associated with placing implants with crowns in comparison to placing three-unit bridges or root canals with crowns, and the respective associated restorative and/or surgical procedures.

"It is our understanding that this research is the first to explore these important issues," said Richard Hastreiter, DDS, MPH, in a press release. Hastreiter, coauthor of the study, also is dental director and vice president of oral health management and analytics at Delta Dental Plan of Minnesota.

The study, conducted by Delta Dental Plan of Minnesota, revealed the average initial cost of implants with crowns and associated procedures was the most pricey, $3,255; followed by three-unit bridges and associated procedures, $2,410; and root canals with crowns and associated procedures, $1,591.

Honors

The Academic Senate Committee on Academic Personnel at the University of California, San Francisco, has recognized **Michael McMaster, PhD**, withl a 2005-2006 Distinction in Teaching Award. Joining the UCSF faculty in 1994, he is an assistant adjunct professor in the Department of Cell and Tissue Biology at the School of Dentistry.

The award recognizes distinction in teaching for faculty at the school for more than five years.

Fluoride Varnish, Education Helps Stem Decay in Toddlers

According to a study at the University of California San Francisco School of Dentistry, fluoride varnish lowers the rate of early childhood tooth decay in combination with dental health counseling for parents.

Investigators examined caries-free infants and children, predominantly from low-income Hispanic and Chinese families in San Francisco. All of the families were counseled on dental health and the children were randomly placed into three groups: those receiving fluoride varnishes twice a year; those getting the dental preventive treatment once a year; and those not receiving any treatment. Of the 376 children initially enrolled, 280 completed the study.

Children not receiving any fluoride varnishes were more than twice as apt to develop tooth decay as the group assigned to getting the annual fluoride, according to the study's findings. Those who did not receive varnish were close to four times more likely to develop tooth decay than those receiving it twice a year (four treatments over a two-year period). The results were published last February in the *Journal of Dental Research*, the journal of the International Association of Dental Research as well as online, http://jdr.iadr-journals.org.

Jane Weintraub, DDS, MPH, Lee Hysan Professor at the University of California San Francisco School of Dentistry and principal investigator of the study, said there are two key points parents should know.

"First, the results support the use of fluoride varnish to prevent tooth decay in very young children. Second, the results support parents bringing children for their first dental visit at age 1 when they are getting their first teeth.

"Fluoride varnish is relatively inexpensive, easy to brush onto a child's teeth, and can be part of a positive first dental visit to help prevent tooth decay," Weintraub said. "In contrast, when very young children get cavities, it is difficult for them to sit still for dental treatment. Often, young children needing many fillings receive care in the operating room, at great expense to their family and with the additional risks posed by general anesthesia. We now have an easy, low-cost way to keep teeth healthy."

It had been previously been shown that varnish prevents tooth decay for older school-age children who have permanent teeth. This was the first randomized study of children as young as six months old and shows the efficacy of fluoride varnish to prevent tooth decay in a young child's baby teeth.

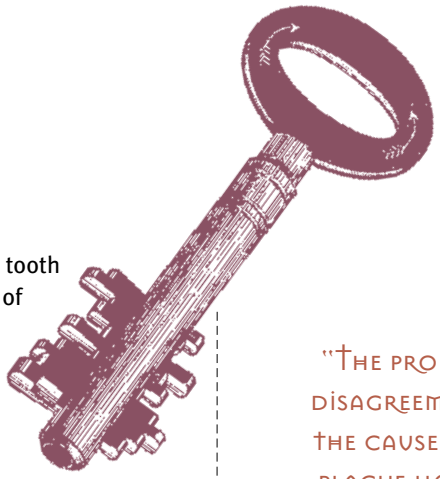
Dental Records Ranked Higher Than DNA Testing in Identifying Tsunami Victims

When it came to identifying the bodies from Thailand's tsunami, dental records outperformed DNA testing. According to an article in *New Scientist* magazine, the bodies of some 75 percent of victims were identified using dental records; 10 percent using fingerprints; and 0.5 percent using DNA.

Nick Bracken of London's Metropolitan Police and commander of the Information Management Center based in Thailand said that because DNA testing, although accurate, requires multiple samples from living relatives, as well as refrigeration and highly specialized laboratory equipment, it is not the ideal technology in identifying large numbers of disaster victims.

Researchers made tentative identification using pictures of smiling victims in cases where dental records were unavailable or did not exist.

Dental Pulp Key to Unlocking Ancient Mystery



The discovery of an ancient mass grave and recently extracted DNA from tooth pulp have scientists convinced it was typhoid fever that wiped out one-third of the population in Athens in 430 BC.

Anthrax, Ebola fever, Lassa fever, and tuberculosis previously had been suggested as the cause of death to leader Pericles, his people and the golden age of Athens.

"The profound disagreement on the cause of the plague has been due to the lack of definite microbiological or palaeopathological evidence," wrote Manolis Papagrigorakis, DDS, assistant professor at the University of Athens School of Dentistry. However, the unearthing of a mass grave dating from the time of the plague appears to have answered the long-time question.

In the *International Journal of Infectious Diseases*, scientists said they took three teeth at random, extracted DNA from the dental pulp, and compared it with sequences from anthrax, cowpox, cat-scratch disease, tuberculosis and typhus. It matched with typhoid fever.

"The profound disagreement on the cause of the plague has been due to the lack of definite microbiological or palaeopathological evidence."
MANOLIS PAPAGRIGORAKIS, DDS

Marfan Website Provides Assistance to Dental Professionals

The National Marfan Foundation now features on its website dental and orthodontic information on the genetic disorder that affects the body's connective tissue, including the skeleton, eyes, blood vessels, and heart. An estimated 200,000 Americans have Marfan syndrome or a related disorder.

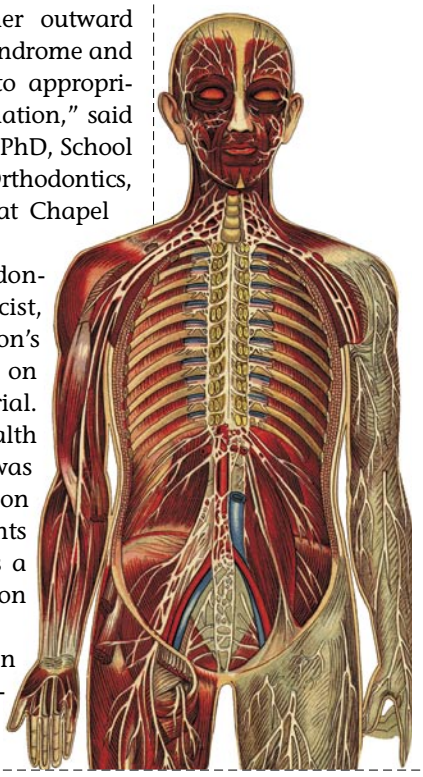
Those with the potentially life-threatening disease have high-arched palates and narrow jaws, which can pose dental problems. While there is limited research on the specific management of the orthodontic problems typically seen in individuals with Marfan syndrome, orthodontic care is an essential part of managing the disorder, especially in children, according to a press release from the National Marfan Foundation.

Some may be at severe risk without proper diagnosis and subsequent treatment because potential aortic enlargement predisposes those with the disorder to aortic tear and rupture. Additionally, those with artificial heart valves and valve prolapse are at risk for infection of heart valves and the heart when having dental work performed. The foundation suggests that recommendations regarding endocarditis prophylaxis be followed, and more information is available in the foundation's "Dental and Orthodontic Concerns" brochure. The brochure can be found on the foundation's website, www.marfan.org, under the heading "Living With Marfan Syndrome."

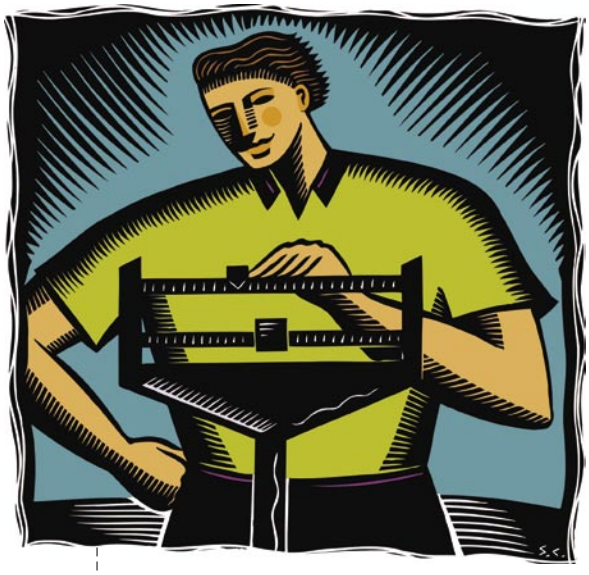
"Many people with the Marfan syndrome do not know that they have the disorder, but they may be visiting a dentist or orthodontist for treatment of the specific dental aspects. In these cases, it is important for the dentist or orthodontist to combine their observation of the face and mouth with their knowledge of other outward physical signs of the Marfan syndrome and to refer a suspicious patient to appropriate specialists for further evaluation," said Sylvia A. Frazier-Bowers, DDS, PhD, School of Dentistry, Department of Orthodontics, University of North Carolina at Chapel Hill, in a press release.

Frazier-Bowers, an orthodontist and molecular geneticist, consulted with the foundation's Professional Advisory Board on the development of the material. A not-for-profit voluntary health organization, the foundation was created to provide information about the disorder to patients and physicians, and serves as a resource for medical information and patient support.

For more information on Marfan syndrome, visit the website or call (800) 8-MARFAN.



Significant Predictor of Periodontal Disease: Obesity



There's a new reason to get fit and stay that way: Researchers have found that obesity is a major predictor for periodontal disease. The finding, published in a recent supplement to the *Journal of Periodontology*, is independent of one's gender, race, age, or whether one smokes or not.

What's more, analysis of the national sample suggested that insulin resistance mediates the relationship between periodontal disease and obesity, and that the severity of periodontal attachment loss proportionally climbed with increased insulin resistance. Researchers from the University of Buffalo also found that the number of teeth lost dramatically rose with elevating levels of insulin resistance. Individuals in the highest insulin resistance category lost 1.1 more teeth than those in the lowest category.

A total of 12,367 non-diabetics from age 20 to 90 participated in the dental section of the Third National Health and Nutrition Examination Survey. Of these, 47 percent were women and 53 percent were men, and 43 percent of all the individuals were overweight.

"People who have a higher body mass index produce cytokines (hormone-like proteins), that lead to systemic inflammation and insulin resistance," said Robert J. Genco, DDS, PhD, editor of the *Journal of Periodontology* and vice provost at the University at Buffalo. "We propose that chronic stimulation and secretion of pro-inflammatory cytokines associated with periodontal infection also occurs, contributing to insulin resistance, which may further predispose to diabetes mellitus."

Genco and his research team recently showed that diabetics who have periodontal disease may have greater mortality from diabetic complications ranging from kidney complications and cardiovascular disease than their counterparts with little or no periodontal disease.

"The presence of periodontal infection combined with obesity may contribute to type 2 diabetes and its complications, such as coronary heart disease," said Kenneth A. Krebs, DMD, and president of the American Academy of Periodontology. "Although further studies are needed, people should remember that living a healthy lifestyle along with daily brushing and flossing and visiting your oral health care provider is always in fashion."

"People who have a higher body mass index produce cytokines (hormone-like proteins), that lead to systemic inflammation and insulin resistance."

ROBERT J. GENCO, DDS, PHD

Upcoming Meetings 2006

Sept. 15-17	CDA Fall Session, San Francisco, (866) CDA-MEMBER (232-6362).
Oct. 7-11	Pacific Coast Society of Orthodontists 70th Annual Session, Honolulu, Hawaii; www.pcsortho.org, (415) 674-4500.
Oct. 11-13	Pacific Coast Society of Orthodontists post-meeting program, Poipu Beach, Kauai; www.pcsortho.org, (415) 674-4500.
Oct. 16-19	ADA Annual Session, Las Vegas, (312) 440-2500.
Nov. 2-4	Hispanic Dental Association 14th Annual Meeting, Universal City, www.hdassoc.org or (217) 793-0035.
Dec. 3-6	International Workshop of the International Cleft Lip and Palate Foundation, Chennai, India, (91) 44-24331696.

To have an event included on this list of nonprofit association meetings, please send the information to Upcoming Meetings, *CDA Journal,* 1201 K St., 16th Floor, Sacramento, CA 95814 or fax the information to (916) 554-5962.

Evidence-based Dentistry: Fundamentals for the Dentist

Janet Bauer, DDS, MSEd, MSPH, MBA; Francesco Chiappelli, PhD; Sue Spackman, DDS; Paolo Prolo, MD; and Richard Stevenson, DDS

ABSTRACT

This article explains the fundamentals of evidence-based dentistry for the dentist. Evidence-based dentistry is a discipline whose primary participant is the translational researcher. Recent developments have emphasized the importance of this discipline (clinical and translational research) for improving health care. The process of evidence-based dentistry is the reciprocation of new and existing evidence between dentists and quantitative and qualitative researchers, facilitated by the translational researcher. The product of this reciprocation is the clinical practice guideline, or best evidence, that provides the patient options in choosing treatments or services. These options are quantified and qualified by decision, utility, and cost data. Using shared decision-making, the dentist and patient arrive at a mutual understanding of which option best meets an acceptable and preferred treatment course that is cost effective. This option becomes the clinical decision.

Evidence-based dentistry is a discipline, training researchers to critically analyze new and existing evidence. The analysis follows those principles and rules that determine any systematic inquiry: the collection, classification, and utilization of numerical facts or data in making inferences about a subject. In evidence-based dentistry, evidence is derived from clinical trials, case and cohort studies, as well as case series and reports, literature reviews, clinical expertise, opinions, and concepts. Evidence may also



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Guest editor / Francesco Chiappelli, PhD, is an associate professor, Division of Oral Biology and Medicine at the UCLA School of Dentistry.

Patent Statement / The content and any computer software program derived from said content from this manuscript is covered by a provisional patent pending.

include animal and *in vitro* research when human data is unavailable. The methodologies of evidence-based dentistry include basic and clinical research, the systematic review, meta-analysis, and the systematic evaluation of the statistical analysis of an original systematic review. These methodologies and the evidence subsequently derived, are developed and disseminated by translational researchers to dentists. This article presents and describes the fundamentals of evidence-based dentistry.

Evidence-based Dentistry

In November 2005, the National Institutes of Health codified the discipline of Clinical and Translational Science, calling for the development of such programs in academia.[1] Clinical and translational science is committed to discovering new knowledge and implementing biomedical and behavioral clinical advances rapidly into patient care. Along with conducting research, faculty of this discipline are involved in the training of graduate and postgraduate translational scientists, as well as integrating education and research across multiple disciplines and fields of study. For evidence-based dentistry, translational scientists work with all participants from discovery to implementation of scientific inquiry and technologies into patient care. For the dentist, this means that the translational researcher is the individual who provides best evidence, in a form conducive to the private practice routine, for shared decision-making. Within the dentist-patient relationship, shared decision-making is integral to informed consent. To accomplish this purpose, translational researchers work with other researchers, dentists, and current and potential dental patients in creating evidence usable for decision-making.

Quantitative Researcher

For the translational researcher, the quantitative researcher produces decision data that must meet an explicit standard of acceptance. Decision data is knowledge or evidence in its basic form that explains "why" structures, processes, and systems behave as they do. These are scholarly pursuits that explain and contribute to new knowledge using parametric, technological, animal, or human models. Evidence, from clinical studies on humans, contributes to explaining the "what" in improving or rehabilitating health — what is effective. The highest explicit standard for clinical studies is the randomized, controlled, and double-blinded clinical trial.

Qualitative Researcher

The qualitative researcher produces utility data that too must meet an explicit standard of acceptance. These are scholarly pursuits that also explain and contribute to new knowledge by investigating the attitudes, beliefs, and preferences of both dentists and dental and potential dental patients alike. Understanding behaviors brings an efficacy of care component to decision data. In other words, dentists and patients may perceive differently the effectiveness of care depending on their life processes. This understanding may be complicated because it changes over time and may be subject to prevailing social norms and mores.

Dentists

For the translational researcher, dentists may develop knowledge implicitly from clinical practice. Evidence is developed from applying knowledge logically based on concepts learned during training and implicitly in rendering health services based on experience and patient characteristics of well-being. In providing dental care services, the dentists may contribute to the understanding of the "when, where, and how" of knowledge — when, where, and how it is effective.

Patients

Patients are typically categorized as the consumers of products and services and not the developers or guarantors of knowledge. However, patients may be advocates or adversaries of evidence. They may exert influence on the development and application of knowledge that does not necessarily meet acceptance criteria of researchers and dentists, but serves a personal need. They may also exert pressure to deny the development and application of knowledge that is contrary to their philosophical beliefs. Even in the profession's best efforts of informing patients with best evidence and using clinician expertise to communicate individualized, effective treatments, patients ultimately decide if treatment regimens are adhered to or rejected outright.

Translational Evidence-based Dentistry Researcher

The ultimate goal of translational evidence-based dentistry researchers is a process to discover and disseminate advances in health care that produce behavioral change in making clinical decisions for both the dentist and patient. This is a dynamic process in which best evidence quantifies risks and benefits.[2] This process considers decision data on the "average patient," or quantitative research and clinical expertise and experience, in applying evidence to local factors. It also considers the integration of utility data, or qualitative evidence on the "average patient," in applying contextual ways to best communicate information and determine compliance in people's lives. The result of this process is the clinical decision, effective and efficacious health care for the individual patient.

For the research side of the process, the translational evidence-based dentistry researcher is concerned with the soundness and generalization of information; whether findings can be applied to similar patients in similar settings. Significance is statistical significance, or the acceptance that some relationship exists between two variables, the acceptance of a measure of a variable. The variables are chosen to demonstrate rapid, dramatic effects.

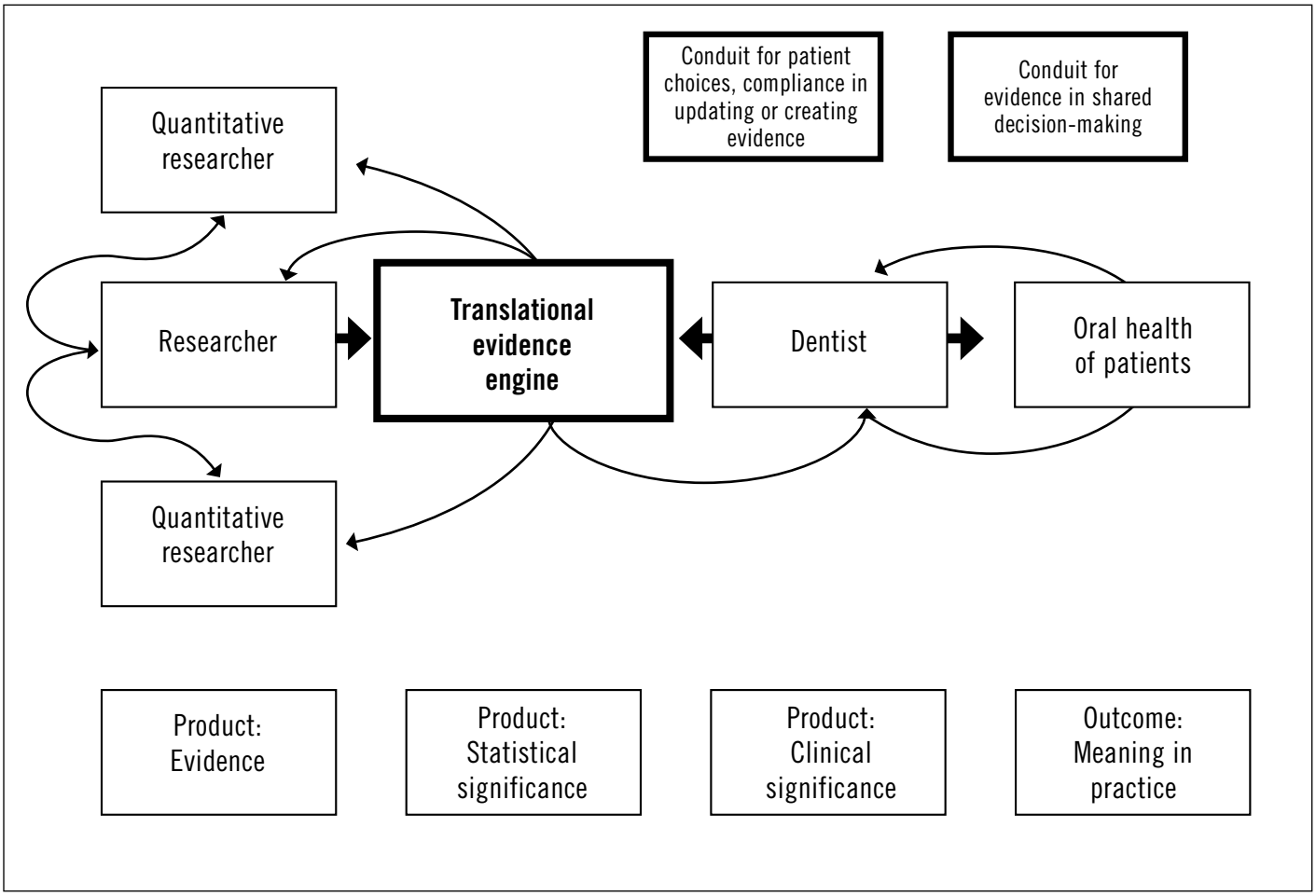

Figure 1. This illustration details a process of translating scientific evidence into better health care. The central component of this process is the translational researcher who organizes, administers, and implements the translational evidence engine.

Concerns are stated in terms of validity and reliability of study design to express confidence in providing best evidence.

For the clinical side of the process, the translational researcher is concerned with clinical significance; whether research findings can make a difference in patient care delivery. Clinical significance addresses the importance of the evidence that takes into consideration the long-term multifaceted monitoring of evidence in the context of human behavior. However, clinical significance may vary between dentists and between patients. This difference results because dentists, as well as patients, make judgments that weigh differently personal and professional experiences, values and preferences, and appropriate practices.[3] In other words, judgments of risk and benefits vary because of differences in weights given to values and preferences that also include costs.[4,5] All is important for patients in accepting best evidence in their acquiring the highest level of cost effective services, either through fee-for-service or as a defined benefit of their dental insurance plan.

Translation Evidence-based Dentistry Process

Figure 1 details a process of translating scientific evidence into better health care. The central component of this process is the translational researcher who organizes, administers, and implements the translational evidence engine. As a researcher, the translational researcher engages in identifying, designing, and coordinating with quantitative and qualitative researchers to produce decision data. In addition, the translational researchers perform systematic reviews, meta-analysis, and systematic evaluation of the statistical analysis on published data. A systematic review is collection, classification, and utilization of numerical facts or data from each level of evidence available to the translational researcher. Each in their own

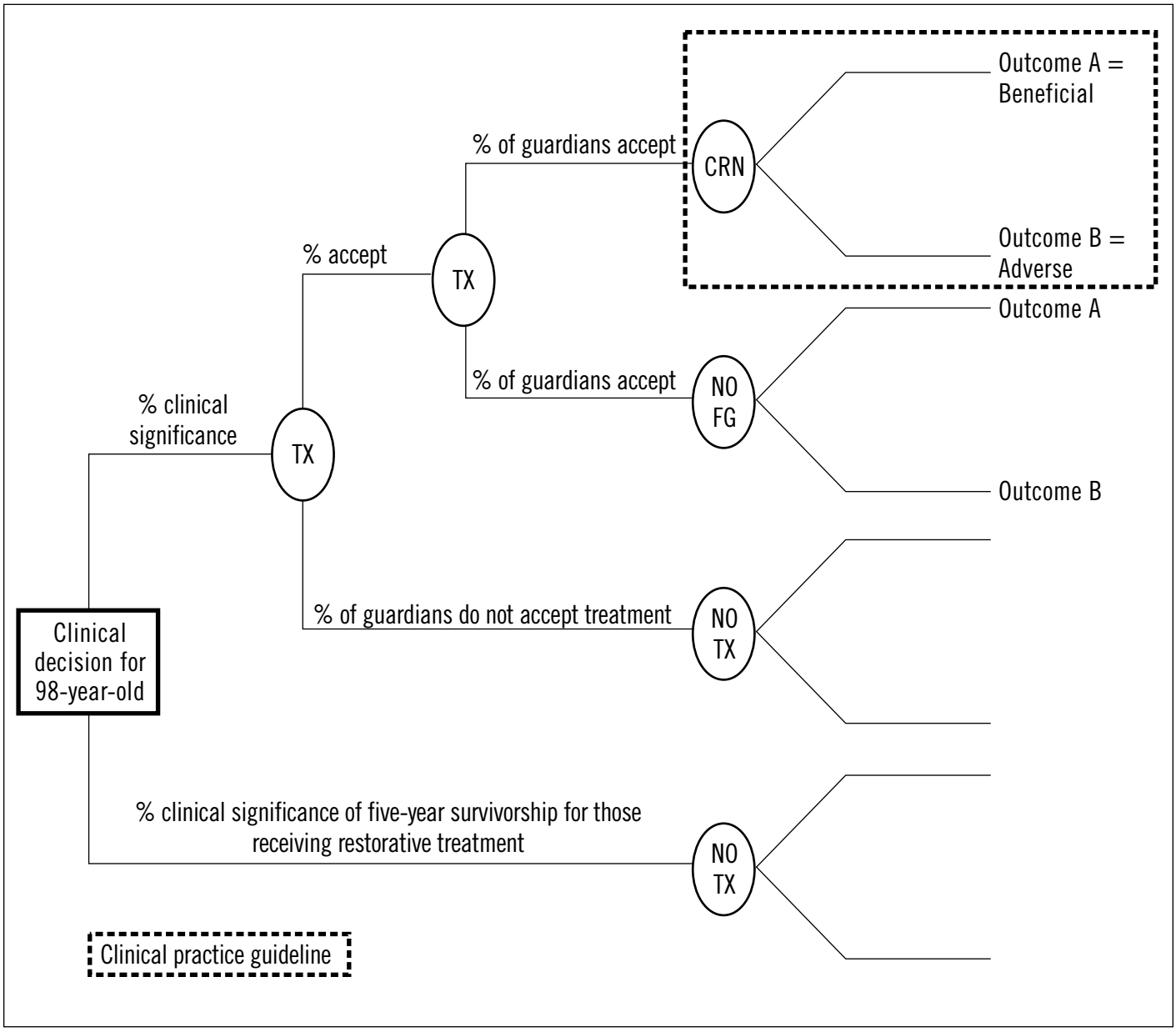

Figure 2. A clinical practice guideline is the ending branch of one particular pathway in a decision process. This diagram represents the consequence of several courses of action, read from left to right.

study or descriptive designs is analyzed to identify those resources that provide the best evidence in their respective domains. From the design domains, a consensus is arrived at to determine best evidence to provide decision or utility data for a specific research question. A meta-analysis, on the other hand, compiles individual research studies into one all-encompassing, albeit, simulated clinical trail. The data is analyzed to provide population-based decision or utility data. The product of the analysis is best evidence that conforms to statistical significance and the rigors of scientific study on humans. The outcome of this product is providing decision and utility data for use in dental practice.

Clinical significance of decision data is coordinated with dentists in developing nationally, regionally, or locally relevant best evidence. The dentist is provided decision data in the form of

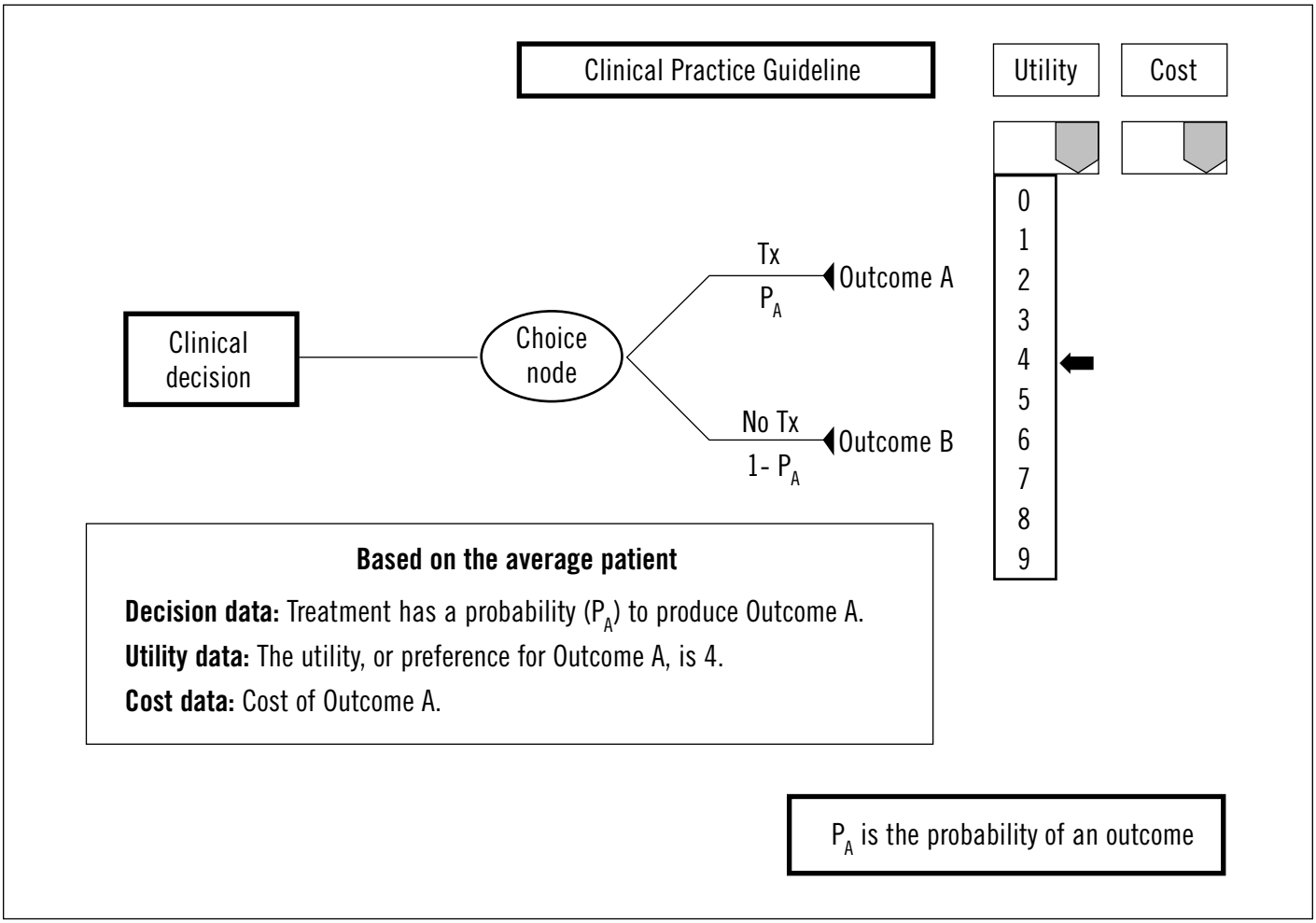

Figure 3. This is an example of a clinical practice guideline. A clinical practice guideline has a minimum of one choice or option, with two outcomes. In making a clinical decision, the clinical practice guideline is analyzed from right to left.

a clinical practice guideline, which is explained later. The dentist provides an assessment of the clinical significance of the decision data based on practice and local factors. This assessment is used by the translational researcher to reject or modify the clinical practice guideline or to re-identify and conduct investigations that produce other clinically relevant decision data.

Implementation

The translational evidence-based dentistry process starts with a clinical question. The clinical question is the purview of the dentist, having the expertise and experience to ask oral health questions or practice needs based on real conditions and situations. For patient care, the formulation of oral health questions is derived from shared decision-making. Shared decision-making involves the patient in determining needs and preferences for dental treatments, therapies, or services relevant to the patient's presenting conditions. This clinical question is turned into a research question by the translational researcher using the PIC/PO format. Through a central database, the translational researcher then provides a clinical practice guideline that the dentist then uses to reach with the patient a mutual understanding of what is acceptable and desirable dental care, or the clinical decision. Thus, the dentist acts as a conduit for the patient who is responsible for making best clinical decisions for their particular condition and situation.

Follow-up

Follow-up is the assessment of the clinical practice guideline based on the patient's clinical decision. This assessment determines the meaning of the clinical practice guideline in practice, and is patient dependent.

This follow-up is made at the time of the clinical decision and at subsequent periodic dental examinations or visits. For follow-up, the patient provides their preferences and values of dental services (choices) for updating utility data associated with the clinical practice guideline. Updating decision data is provided through patient compliance and outcomes dependent on patient healthy lifestyles and dental behaviors. With input from the dentist, the translational researcher uses these periodic assessments to update the clinical practice guideline, identifying new areas of research or improving its usefulness in private practice. Thus, the dentist acts as a conduit for the researcher in providing local data regarding patient choices, compliance, and treatment outcomes in updating or creating new evidence. Having an efficient evidence-based dentistry process has an additional benefit of involving private practice as a unit of clinical research without disrupting normal patient flow or care.

Clinical Practice Guideline

A clinical practice guideline is the ending branch of one particular pathway in a decision process (**Figure 2**); it represents the consequence of several courses of action, read from left to right. The decision process is called an algorithm.[6] An algorithm is a visual representation of a decision process, containing numerous pathways (branching) that are involved in decision-making. It does not include predisposing factors or other factors that determine risks; it only shows a decision process. A predictor model, not an algorithm, considers factors that may alter predictions of an individual's risk to a treatment or condition (risk factors) that is being studied. Algorithms do not produce predictions; instead, they provide a consensus driven model of a decision-making process.

Clinical Practice Guideline

Figure 3 is an example of a clinical practice guideline. A clinical practice guideline has a minimum of one choice or option, with two outcomes. In making a clinical decision, the clinical practice guideline is analyzed from right to left. Decision data is the probability of the outcome and provides evidence of which outcome is better. Baseline probability of an outcome represents that of the "average patient." Utility data is a measure of preferences or values, given in a scale with a number between zero and nine. Utility data provide patients with trade-offs from which the patient can select which outcome maximizes or optimizes their preference or value for a particular service. Baseline utility data is based on the preferences and values of the "average patient." Economic, or cost, data provides patients with the cost of outcomes. These costs may reflect the practice fee-for-service schedule or one that reflects dental insurance coverage. The patient can then make their choice of a particular service based on financial concerns.

Decision Analysis

The objective of the decision analysis is to optimize a clinical decision. Analysis of the data is done by multiplying decision and utility data in offering the patient a quantified and qualified choice of which treatment they would prefer based on a given probability of a desirable outcome. By multiplying decision and cost data, the patient may determine the economic choice difference between outcomes. The result of the analysis of each type of data is to determine the expected utility between options and their expected costs. By comparing the two results, the patient can determine the best option.

Sensitivity Analysis

A sensitivity analysis determines which components have the greatest impact on the clinical decision, for example, utility or cost. The analysis may be done to determine the effects of changes in one of the components or two or more of the components.

Summary

Providing best evidence for shared decision-making in the patient-dentist relationship is the responsibility of the translational researcher. The translational researcher organizes, administers, and implements a process (termed here the translational evidence-based dentistry engine) that turns best evidence into a clinical practice guideline for use in dental practice. The process provides decision, utility, and cost data in offering treatment or service options that the dentist and patient may mutually come to an agreement on in maximizing, or optimizing, a clinical decision. An additional benefit may incorporate private practice as a community research unit in advancing oral health care research. CDA

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overcoming BARRIERS

The Challenges of Transferring Evidence-based Dentistry Into Practice

Richard T. Kao, DDS, PhD

ABSTRACT

The goal of evidence-based dentistry is to help practitioners provide their patients with optimal care. This is achieved by integrating sound research evidence with personal clinical expertise and patient values to determine the best course of treatment. Though clinicians embrace this concept, its implementation in clinical practice has been slow. In this paper, barriers against the implementation of evidence-based care are examined and possible solutions are offered.

The dental profession is committed to providing the best possible dental care for patients. This is proving to be more complex due to a virtual "information explosion" on new therapies, techniques, and materials; increased consumer understanding of treatment possibilities and therapeutic outcomes; and changing socio-demographic patterns. Though the profession advocates the importance of evidence-based dental disease prevention and treatment, practitioners have been slow to implement this concept.

In 2003, the California Dental Association formulated an evidence-based dentistry action plan that included the formation of a task force to monitor evidence-based dentistry efforts and implement programs to educate CDA members on this methodology. The challenges of transferring evidence-based dentistry into clinical practice

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were key issues addressed by the task force, and much of their deliberations and perspectives are reflected in this paper. Possible solutions for eliminating barriers against evidence-based care will also be explored.

What Is Evidence-based Dentistry and How Do Dental Practitioners Interpret It?

The CDA Task Force on Evidence-Based Dentistry recommended a definition of evidence-based dentistry drawn from the "Oral Health in America" report by the U.S. surgeon general, which is philosophically consistent with the American Dental Association's definition.[1,2] Evidence-based dental practice is the integration of an individual practitioner's experience and expertise, with a critical appraisal of relevant available external clinical evidence from systematic research, and with consideration for the patient's needs and preferences. This definition stresses the importance of three elements: a dentist's expertise and clinical judgment, relevant clinical evidence that is present in the literature, and the informed patient's preference. In a dental practice that incorporates an evidence-based approach, the practitioner's experience is primary since it is his responsibility to consider all three components when defining the best course of treatment. Ideally, evidence-based treatment is characterized by the intersection of these three elements.

Barriers Against Evidence-based Care

Though the concept appears fundamentally simple and reasonable, clinicians have been slow to implement evidence-based dentistry. For clinical practitioners, evidence-based dentistry as a concept is not unlike the logical and common-sense patient-oriented approach that was advocated in the 1980s and 1990s as comprehensive care. The significant difference is the emphasis on clinical decision-making based on the body of evidence present in the literature. This difference has deterred the implementation of evidence-based care. It has been suggested that perhaps as little as 8 percent of dental care is justified by peer-reviewed, published, and appropriately analyzed dental research.[3,4] This paper will examine barriers that clinicians encounter in their attempts to incorporate evidence-based dentistry into clinical practice.

DESPITE THE GROWING NUMBER OF SYSTEMATIC REVIEWS, MORE THAN ONE-HALF OF THESE ARE UNABLE TO ANSWER THE KEY CLINICAL QUESTION DUE TO WEAK STUDIES.

The Information Overflow Barrier

One of the main concerns clinicians have is the challenge of keeping up with a constantly expanding knowledge base. No one knows exactly how many dental research articles are published in a single year. In 1998, it was estimated that approximately 10,000 dental research articles were published in English.[5] Considering the fact there is an equal amount of research published in foreign languages, this number may safely be doubled.

It is inconceivable for private practitioners to even consider analyzing this overwhelming volume of research. Therefore, most rely on systematic reviews. Unfortunately, the number of systematic reviews that address clinical topics in dentistry is small, but growing.[6] The Cochrane Library lists only three reviews that met the minimum criteria for systematic reviews published in 1993. However, in 1999 there was an exponential increase to 484 reviews. Systematic reviews not only identify all relevant information contained in the literature, but also define the key question, inclusion and exclusion criteria, and literature search parameters, and evaluate the quality of the study and information obtained. When systematic reviews are structured appropriately, multiple studies may be combined to potentially provide clinical insight. Further scrutiny of these reviews indicates that these reviews may not be clinically relevant or available to practitioners.

A recent survey was performed of systematic reviews from 1966 to December 31, 2002, on MEDLINE and the Cochrane Library's Database of Abstracts of Reviews of Effectiveness.[7] A total of 592 articles were identified and those lacking a well-defined search process, clearly delineated inclusion and exclusion criteria, and a re-examination of the raw or synthesized data from all included studies were eliminated. Furthermore, reviews not published in English were excluded. Using these criteria, 131 systematic reviews were identified, only 96 of which had direct clinical relevance. These 96 reviews covered a wide range of dental topics; however, 17 percent of them concluded that the evidence was insufficient to answer the key question. An additional 50 percent hedged in answering the key question, noting that the supporting evidence was weak or limited in quantity. It was concluded that despite the growing number of systematic reviews, more than one-half of these are unable to answer the key clinical question due to weak studies.

An additional problem with systematic reviews is their inability to inform practitioners about new dental materials and techniques, such as the ever-evolving implant design materials, tooth-colored restorative materials, and adhesives. Both the names and formulations of these products are changing so rapidly that it is difficult to sort them out. Further complicating this situation are savvy sales representatives who

often provide slick marketing pieces with questionable claims. Some practice consultants even view these sales representatives as the key providers of information about advances in dental services, products, and technology.[8] In the absence of reliable systematic reviews and scientifically sound data, clinicians are forced to depend on either clinical trial and error or commercial market information.

Further confounding clinicians is the fact that the few relevant systematic reviews published in journals often are interspersed with weaker studies and case reports/series. Consequently, in addition to being inundated with non-refereed journals and marketing information, clinicians perceive there is a dental information overflow, and they are unable to distinguish the presence and importance of valid published systematic reviews. Additionally, there are few good systematic reviews that definitively guide practitioners on clinically relevant procedures. Perhaps the difficulty of implementing evidence-based care is that the amount of relevant clinical evidence is so poor or the questions are so unrelated to clinical issues that it appears that evidence-based dentistry is not used. The challenge for evidence-based dentistry advocates is to ensure the increase in the number of systematic reviews that address well-defined and clinically relevant key questions.

Guideline or Treatment Algorithm Barrier

Despite their limited number, clinicians question whether these systematic reviews can lead to conclusions that will result in clinical practice guidelines.[7] Practitioners are then concerned about whether they must firmly adhere to such guidelines. Although dentists' adherence to clinical practice guidelines has not been studied extensively, factors influencing physician adherence have been examined.[9] These studies have shown that there are several impediments, such as unawareness of the existence of guidelines, personal disagreement with the guidelines, lack of confidence in expected results, practice inertia, and other external barriers. In the independent and often isolated dental practice environment, these same barriers may prove to be just as difficult, if not even more significant.

CLINICIANS PERCEIVE THERE IS A DENTAL INFORMATION OVERFLOW, AND THEY ARE UNABLE TO DISTINGUISH THE PRESENCE AND IMPORTANCE OF VALID PUBLISHED SYSTEMATIC REVIEWS.

Patient-Related Barrier

Patient preferences can be a barrier to adherence to evidence-based care. Patient decisions about care are based on two major factors: personal desire and insurance benefits.

With increased dental advertising and ready access to information on the Internet, today's patients are well-informed consumers. Commercial marketing of esthetic and implant dentistry procedures and results have resulted in more demand for these services. Though there are longevity and survival studies for esthetic materials, the nature of these materials is changing so rapidly it is not clear whether this information is still germane to the various generations of composites, adhesives, veneer materials, and implants entering the marketplace. When such an information void exists, it is easy to be influenced by marketing jargon and non-refereed publications. In the face of growing patient demand, non-existent evidence, and significant economic gains associated with these services, it is difficult for clinicians to provide evidence-based care.

Insurance benefits warrant attention since approximately 69 percent of patients have dental insurance.[10] Practitioners are understandably concerned that the insurance industry may misuse information to define evidence-based dentistry and dictate the types of procedures and treatment that will be covered. This fear stems from dental carriers' history of regulating covered services and terms of re-treatment. Instead of informing the public that these regulations are based on purchase-service utilization analyses, third parties frequently suggest in their denials that provided services are not clinically sound or scientifically based. Additionally, outcomes assessment in terms of patient satisfaction has largely been ignored by the insurance industry. Though patient satisfaction can be quite high for esthetic procedures such as esthetic crown lengthening, bleaching, veneers, and dental implants, these procedures are generally not covered benefits. Insurance carriers have given the public the impression they define the parameter of care through their regulations and coverage, even though their decisions may often be contrary to evidence obtained from well-designed, peer-reviewed studies and patient preferences.

Internal and External Barriers Faced by Clinicians

CDA's definition of evidence-based dentistry emphasizes the importance of a dentist's expertise and clinical judgment. Though these are largely based on past clinical experiences, other factors can influence the clinician's decision.

Awareness and familiarity with the evidence remain one critical problem. It is clear that most clinicians either do not have access to or are not capable of evaluating the primary literature. Though there are numerous articles that inform clinicians on the art of evaluating the literature, most clinicians are still heavily dependent on systematic

reviews.[7,11-18] As previously mentioned, there are presently a limited number of reviews, with the majority hedging on definitive clinical recommendations due to weak or limited supporting evidence.[7] Faced with these systematic reviews, clinicians' first intuition is to decide if the key question is clinically relevant. Even with relevant reviews, clinicians may not agree with a specific guideline due to personal experiences or expected outcomes.

There are also internal barriers which may prevent adoption of evidence-based dentistry. Clinicians may fall prey to practice inertia and not be motivated to change. Altering therapeutic regimens in a small practice may require behavioral adaptations among the staff. At times, clinicians still practice in the same fashion as they were taught in their earlier training. Though this is inappropriate given the rate of change in clinical dentistry and availability of continuing education courses, this nevertheless does occur. Additionally, many of the procedures and decisions are financially based. Though a more conservative and less profitable procedure may be evidence-based, clinicians still need to deal with the temptation of providing a more profitable procedure. This is driven by both business pressure associated with a running a practice and the need to make a living.

External factors not under the clinician's control also impact evidence-based dentistry. For example, necessary access to certain equipment or changes in facility design may be cost-prohibitive, making adherence to certain aspects of evidence-based dentistry difficult. Other barriers include insufficient staff support, poor reimbursement, escalating practice operational costs, and increased liability.

Embracing Evidence-based Care

Evidence-based dentistry have been the buzzwords for the type of quality dental care promoted by academicians and dental policymakers for the past decade. Yet, this practice philosophy has not been readily embraced by clinicians. This paper has revealed barriers against universal acceptance of evidence-based care, but what are some possible solutions?

Evidence-based care has much potential in improving patient care.

AT TIMES, CLINICIANS STILL PRACTICE IN THE SAME FASHION AS THEY WERE TAUGHT IN THEIR EARLIER TRAINING.

The central problem with its implementation is there is a lack of respect and appreciation between the various stakeholders in evidence-based dentistry. The academicians and evidence-based dentistry advocates fail to acknowledge that much of the evidence are not clinically relevant or are weak. Additionally, their ability to define clinically relevant key questions can be greatly improved by working closer in association with clinicians. Lastly, both the quality and quantity of clinically relevant systematic reviews need to increase. With increases in quality systematic reviews, dental associations and health organizations need to take responsibility for the dissemination of this information. This effort to date has not been obvious. For the clinicians, some of the internal and external barriers need to be removed in lieu of possible financial gain in order to provide better patient care. The insurance industry must also make clear the distinction the difference between evidence-based care from actuarial-based care. In defining patient benefit plans, it would behoove all parties to learn more about patient expectations and outcome satisfaction for dental care. Until each of the four stakeholders learn to appreciate the weakness, strengths, potentials, and barriers toward implementation for all concern, the growth and implementation of evidence-based care will be slow.

Academicians and evidence-based dentistry advocates must begin to appreciate that evidence-based dental care entails more than randomized controlled trials, refereed journals, meta-analysis, and systematic reviews. These have little meaning for the clinician trying to provide dental care. The profession must be able to frame answerable questions based on clinical problems. To do so retrospectively through systematic reviews has been a failure to date.[7] The National Institute of Dental and Craniofacial Research recently committed $75 million over the next seven years to establish three practice-based research networks.[19] The proposed objective of the practice-based research networks is to accelerate clinical trials and studies of important issues in oral health care. Though it is of concern that these centers have been awarded funds without any evidence of their ability to develop these networks or define general questions to be addressed, the practice-based research networks may be a golden opportunity to develop the informational-evidence element of evidence-based dentistry.

Instead of conducting systematic reviews or performing meta-analysis on disjointed studies presently in the literature, the practice-based research networks may provide a prospective mechanism for addressing issues of clinical approaches and effectiveness in a real-world environment. The challenge to academicians and evidence-based dentistry advocates will be to design answerable questions based on clinical problems that can be tested in this network. The experts in clinical den-

tistry have always been the practitioners. Academicians and evidence-based dentistry advocates should partner with astute clinicians so basic problems can be identified. It is important these problem areas be identified by frontline dentists and not by bureaucrats, ivory tower academicians, or statisticians. If the questions are appropriately framed, practice-based research networks can generate important and timely information to guide the delivery of dental health care and improve patient outcomes. More importantly, this information is more likely to be accepted, adopted, and translated into daily practice by clinicians.

Another step for removing patient-associated barriers to evidence-based dentistry would be for the dental insurance industry to educate its subscribers on the nature of its business. While it is acknowledged dental insurance benefits promote oral health, it is important for insurance carriers to educate subscribers on the limitations of benefited care. These limitations are based on a business model utilizing employer-paid insurance premiums to provide a defined level of care for employees. When treatment falls outside of this defined level (i.e., cosmetic dentistry, implants, etc.), patient preferences should be respected. In lieu of denials and commentaries, carriers should acknowledge the patient's preference and the treatment as an accepted option despite the fact that it is not covered by insurance.

Given the sheer volume of scientific information available, it will be a challenge for our dental educators, journal editors, and public policymakers to provide an effective information transfer. Though an increasing number of schools and residency programs are instituting curricula for teaching the principles and practice of evidence-based care, success has been limited.[20] It is questionable as to how much of the evidence-based decision-making process is utilized after training. If evidence-based dentistry is to succeed, it is critical that these problems associated with the dissemination of the evidence-based systematic reviews be evaluated. Additionally, evidence-based dentistry teaching strategies need to be developed. This task falls to dental educators, dental associations, and journal editors.

WE ARE IN AN ENVIABLE POSITION WHERE THERE IS FINALLY A CRITICAL MASS OF INFORMATION THAT CAN HELP US IN OUR PATIENT CARE DECISIONS.

Conclusion

Despite the barriers that have prevented evidence-based dentistry from being readily embraced by dental clinicians, there should be no mystery or fear surrounding this concept. This logical, common-sense, patient-oriented approach is not different from the comprehensive care that was the popular in the 1980s and 1990s. The difference is that we are in an enviable position where there is finally a critical mass of information that can help us in our patient care decisions. In evidence-based dentistry, there is a "conscientious, explicit and judicious use of current best evidence" to be used in clinical decision-making.[21] This information is an adjunct, not a substitute for clinical judgment and patient preferences. When used in concert, it has the potential to provide optimal treatment. CDA

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Treating

SPECIAL Populations

Clinical Evidence and Evidence-based Dental Treatment of Special Populations: Patients With Alzheimer's Disease

Francesco Chiappelli, PhD; Ercolano Manfrini, MD; Myeshia Edgerton, MS; Monica Rosenblum; Kristine D. Cajulis; and Paolo Prolo, MD

ABSTRACT

This paper presents the novel domain of evidence-based research in the context of treating the dental needs of patients with special needs. A contrast is made between evidence-based dentistry and traditional dentistry, which is based on the evidence obtained by the dentist, with respect to the needs and the wants of the patient, and from the pertinent and accessible literature. By contrast, evidence-based dentistry is focused on integrating traditional dentistry with "the best available" research evidence. The aim of evidence-based dentistry is to improve clinical decision-making by its reliance on a critical analysis of the entire body of the published pertinent literature. It is a system of information management, and a system of data integration that assist clinicians in the process of meshing systemic clinical expertise, evidence provided by the patient, and the best literature evidence to enhance treatment outcomes. Evidence-based dentistry emphasizes rigorous analysis of evidence from clinical research, as the basis of sound dental practice, while discouraging intuitive and unsystematic approaches and promoting the systematic analysis and appraisal of the literature to determine the best treatment alternatives. In the case of patients with special needs, it is critical whether the dentist practices traditional dentistry or evidence-based dentistry to evaluate whether or not the patient is capable of expressing his or her needs/wants, unless, as in the more severe cases, he/she is accompanied by the caregiver. The purpose of this paper is to demonstrate the use of a simple in-house questionnaire for evaluating the patient's ability to tell the dentist his or her needs and wants accurately. In this context, the paper examines the dental needs of patients with dementia of the Alzheimer's type, DAT.

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Alzheimer's disease is a progressive disease of the brain, which leads to dementia with devastating outcomes. Many other conditions can lead to similar memory loss, confusion, agitation, and metabolic disturbances of many kinds commonly observed in patients with dementia of the Alzheimer's type. Rushing to give a diagnosis of DAT is unwise and not common practice, because an absolute diagnostic test for Alzheimer's disease not being available to date, the diagnosis must depend on observing trends as the disease evolves over time. Patients with DAT typically show progressive loss of cognitive, intellectual, functional, and social abilities, and eventually become fully dependent upon their caregiver and family. The purpose of this report is to introduce a simple in-house questionnaire, which provides the dentist with a satisfactory assessment of the needs and wants of patients with DAT.

It is estimated that about half of all nursing home residents exhibit the probable DAT diagnosis currently. By 2010, more than five million people will be diagnosed with probable DAT in the United States alone. Increasing age is the greatest risk factor for Alzheimer's disease, and one-tenth of the elderly over the age of 65 develop DAT. Nearly half of the people over the age 85 are diagnosed with probable DAT. A person with DAT is expected to live an average of eight years and up to 20 years after the onset of symptoms. There appears to be a genetic propensity for DAT since those who carry apolipoprotein polymorphism are at increased risk for DAT.[1,2]

Current interventions for patients with DAT include acetylcholinesterase inhibitors (AchI), which are indicated for patients with mild to moderate symptoms. Treatment with memantine interferes with the glutamate neurotransmitter receptor system and is the sole intervention recommended for moderate to severe cases of DAT. A spectrum of alternative treatments for DAT has also been proposed, and must be examined judiciously in preclinical, clinical, and evidence-based research studies.[3-6]

In 1906, Alois Alzheimer first described DAT in an autopsy on the brain of a 56-year-old woman, Augusta D. Ms. D had died after several years of progressive mental deterioration marked by increasing confusion and memory loss. The German neurologist described an odd disorganization of the nerve cells in Ms. D's cerebral cortex, the part of the brain responsible for reasoning and memory. The cells contained clusters suggestive of a rope tied in knots. Alzheimer named them "neurofibrillary tangles." There also was an unexpected accumulation of cellular debris around the affected nerves, which are now recognized as the "senile plaques." Alzheimer speculated that the nerve tangles and plaques were responsible for the woman's dementia.[7] Several independent cases soon revealed similar patterns, which led the German psychiatrist Emil Kraepelin to name the disease in honor of his mentor.

PLAQUES AND TANGLES EVENTUALLY TAKE OVER HEALTHY BRAIN TISSUE, DEVASTATE THE AREAS OF THE BRAIN ASSOCIATED WITH INTELLECTUAL FUNCTION, AND PROGRESSIVELY DESTROY THE ABILITY TO REASON, REMEMBER, IMAGINE, AND LEARN.

Plaques and tangles eventually take over healthy brain tissue, devastate the areas of the brain associated with intellectual function, and progressively destroy the ability to reason, remember, imagine, and learn. DAT is characteristically a progressive condition marked, at its onset, by simple forgetfulness of recent events, including recent and follow-up dental visits. Patients at the early and moderate stages of DAT have difficulties in remembering and describing their dental needs and wants.

As DAT progresses, patients experience personality changes, such as poor impulse control and judgment, agitation and aggression, distrust, increased stubbornness, confusion, restlessness, rapid mood swings, fearfulness, anger, and dependence. These changes may catch the unaware dentist off guard upon follow-up visits, when they find that a usually debonair patient has now become argumentative and violent. The disease progresses into difficulty in doing things that require planning, decision-making, and judgment, such as working, balancing a checkbook, driving a car, or remembering fundamental oral and general hygiene. Eventually, patients become passive, apathetic, and uninterested in performing usual activities. In brief, signs of clinical impairment include changes in memory, which are normal in aging. These symptoms are exacerbated in patients with probable DAT by symptoms of difficulties in communicating, learning, thinking, reasoning, and keeping up personal and oral hygiene, which are severe enough to impact on the person's work performance, social activities, and family life.[1,2,5,8]

Therefore, progression of DAT may render the clinical decision-making increasingly complex for the treating dentist. An accurate assessment of the patient's perceived and actual skills provide an invaluable insight with respect to the veracity of dental complaints,

Table 1

Components of the In-house Questionnaire

1.	Overall perception of health	Fs
2.	Perceived energy level	Ps
3.	Perceived mood	Ps
4.	Perceived lifestyle	Es
5.	Perceived memory	Ps
6.	Perceived family relationships	Es
7.	Perceived relationship with spouse	Es
8.	Perceived relationship with friends	Es
9.	Perceived sense of self	Ps
10.	Ability to perform household chores	Eo
11.	Enjoyment of leisure	Eo
12.	Ability to hold financial responsibilities	Ps
13.	Perception that own life is ending	Po
14.	Overall life satisfaction	Po
15.	Have intent to hurt self	Eo

Note: The domains listed in Table 1 can be simply used by the dentist as the questions of the in-house questionnaire (e.g., "What is your overall perception of pain: slight/severe; What is your perception of energy level: low/high). Alternatively, the dentist can develop his or her own questions within each domain, as he/she sees fit to pertain to his or her patient population. The analysis is rigorous enough to sustain these variation in content, so long as it is retained within the constraints of Fs, Ps, Es, Po and Eo listed in the domains above.

and with respect to the wants expressed by patients at the early and moderate stages of DAT.

Assessing Skills in Patients with DAT

Staging systems have been developed that provide useful frames of reference for the process of diagnosis by exclusion, and for clinical decision-making. The stages are artificial benchmarks in a continuous process that can vary greatly from one person to another. For lack of better measures, the Global Deterioration Scale and other similar instruments are reliable diagnostic tools to generate clinical evidence toward an outline of key symptoms characterizing seven stages ranging from unimpaired function to very severe cognitive decline. They are also rather cumbersome in their administration and interpretation. These instruments are useful to outline key symptoms characterizing the progression of the disease, and the efficacy of treatment interventions aimed at slowing its course. Stages 1-3 describe no cognitive decline to mild signs of DAT; stages 4 and 5 refer to moderate and "moderately severe" DAT-associated cognitive decline; and stages 6 and 7 point to the terminal severe and very severe stages of DAT.[1,2,5,8]

A key principle of clinical intervention in the early-moderate stages of DAT (stages 1-5), is to redirect the patient's attention. Effective treatment of patients with mild-to-moderate DAT depends upon the correct assessment of their adjustment abilities, and in aiding the patients to develop and utilize more effective coping skills.[9] In the realm of dental prevention, effective clinical decision-making relies not only upon the Clinical Practice Guidelines and the dentist's expertise, but also on an accurate assessment of the patients needs and wants. Because patients with probable DAT at the early-moderate stages (stages 1-5) maintain enough independence to be able to visit their dentist without the assistance of a caregiver, it is critical that the dentists identify and characterize the patient's ability to describe their symptoms and their desires accurately. In order to obtain that piece of evidence in a quick and reliable manner, a simple in-house questionnaire was designed, which provides important information to the dentist about the patient's actual and perceived level of skills at every follow-up visit.

In-house Questionnaire for Obtaining Evidence About Patients With Early Stages DAT

An in-house questionnaire was constructed to assess well-being, that is, "goodness of fit between the characteristics of the person and the properties of the environment," in a manner similar as that done recently for the elderly.[10,11] The ability of the patient to evaluate his or her actual or perceived well-being, the actual or perceived fit between person and the environment is an essential component of the patients' quality of physical health, memory loss, lifestyle and habits, and independent living skills (**Table 1**).

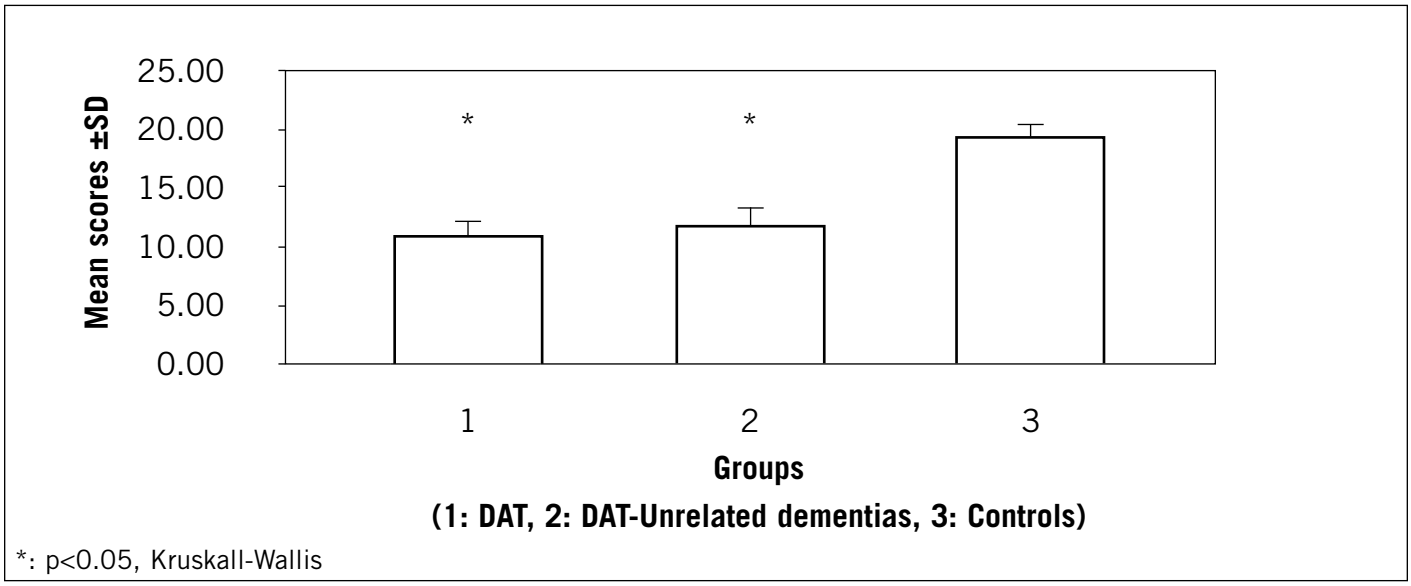

Figure 1. Overall perception of well-being and coping.

The construct of overall well-being was conceived as a measure of coping and adjustment on the part of the patient. It consisted of 13 psychosocial domains, which represented the person's subjective assessment of self (Ps), the subjective evaluation of the environment (Es), the objective environment (Eo), and the person's objective assessment of his or her abilities to meet the demands of the environment (Po) (**Table 1, Appendix**).

The validity and the reliability of the instrument were tested in 200 subjects stratified, based on clinical exam among the groups of senile DAT of stages 1-5 on the Global Assessment Scale (age range: 55-70), of age-matched non-DAT dementias that included vascular dementias, Parkinson's dementia, and dementia with Lewy bodies. Control subjects with no signs of dementia and of the same age range were also used (**Appendix**). Diagnostic criteria for dementia were established by the Mini-Mental State Examination, the Drowning Clock test, and the Assessment of Daily Living, and supplemented by a full neurological status exam, sensorimotor evaluation, and muscular tone assessment. In patients with probable DAT, the clinical evaluation was confirmed by diagnostic CT or MRI scans. Patients with DAT who scored on the Global Assessment Scale at stages 5 and 6 (severe DAT) were excluded. Patients with DAT met the criteria for Alzheimer's disease-associated dementia (as per *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition [DSM-IV]), and/or the probable Alzheimer's disease criteria based on the National Institute of Neurological and Communicative Disorders and Stroke-Alzheimers Disease and Related Disorder's Association. The calculated intra-rater reliability for the questionnaire across the three populations was 0.81±0.085 ($p<0.05$). The calculated Cronbach α internal consistency of the instrument was computed to be 0.78±0.09 ($p<0.05$) across the populations tested. The internal consistency for the assessment of fit of the patients with DAT was 0.875±0.06. That the domains listed in **Table 1** overlap with widely used criteria for the quantification of Alzheimer's disease-associated as well as non-Alzheimer's disease-associated demented state confirms its construct and content validity.

The evidence generated by this instrument is summarized in **Figure 1**. The overall construct of perception of well-being was statistically lower ($p<0.001$) in patients with DAT and with non-DAT dementia, compared to control subjects (**Figure 1**). The inferences derived from this simple instrument provide a critical element for adherence to the customary clinical practice guidelines for dental, medical, and pharmacological intervention, and to ensure optimal clinical intervention for patients with DAT.

Additional Evidence for Patients With DAT: Dental Needs

As DAT progresses, patients become increasingly incapable of completing even the simplest forms of oral care. Primary disease symptoms include a

Table 2

Dental Treatment for Patients With Alzheimer's Dementia

- If possible, the same dentist should see the patient.
- Dental appointments should not be prolonged.
- Schedule appointments in the morning when the patient is usually at his or her most alert and cooperative.
- Dentists should use simple words, short sentences, repeat instructions if necessary, and speak slowly and clearly when communicating.
- Medication should be reduced or discontinued if side effects will interfere with dental treatment.
- If medication is needed, it should be used when it reaches its maximum effect.
- Most importantly, a caregiver should always be present to comfort and reassure the patient.

decrease in oral hygiene, inability to control or retain dentures, difficulty in presenting for treatment and purposelessness chewing.[12] To alleviate these symptoms, the principal solution is for both patient and caregiver to consult with a dentist in order to devise a specialized dental treatment plan, as well as an oral hygiene program. This promotes and facilitates prevention and early detection of dental problems, and is best accomplished while the patient is still in the early stages of Alzheimer's disease.[13] As the disease progresses, it becomes increasingly difficult for the dentist to obtain sound information for the development of a stringent treatment based on the evidence. Traditionally, this evidence comprises the following three domains: a) treatment solely based on the dentist's own clinical assessment – this is the normative need, b) perceived treatment need expressed by the patient; and c) expressed need, which refers to the verbalized request for treatment.[12]

The current paradigm of dental intervention shifts the emphasis to the concerns and needs of its patients, and preventive measures including improved oral hygiene products and practices, better nutrition, dietary modification and improved socioeconomic status. These factors are single-handedly responsible for a decline in dental diseases, overall improved oral health, and an evolution from procedure-oriented care, therapies and treatments, to patient-centered care and prevention.[13]

Following this model, a study examined the normative dental treatment needs of patients with DAT.[14] Of the 85 participants, 72.9 percent needed normative treatment of some sort. Treatment included scaling, prophylaxis, extractions, prosthetic services, denture repairs, relines, and denture adjustments. Another study of 149 people 85-years-old and over found that 37 percent of males and 60 percent of females reported dry mouth. Data showed a significant correlation between the number of medications taken and dry mouth.[15] These patients complained of oral pain, poor tolerance of dentures, loss in taste acuity, and increased incidence of oral infections: gingivitis, periodontitis, oral candidiasis, infectious sialadentis, and multiple dental caries, which are all associated with xerostomia.[15]

Prescribed drugs for patients with DAT make it difficult to perform smoothly routine dental tasks (e.g., oral hygiene) and have serious side effects that increase the risk for to root caries and periodontal disease. The anti-convulsant drug phenytoin may lead to gingival hyperplasia in the presence of plaque. Several antipsychotic agents (e.g., phenothiazines), while controlling behavioral problems, aggression and emotional instability, also lead to xerostomia (i.e., dry mouth).[14] As dementia progresses, partial dentures become an unsuitable solution for patients with DAT because of an increased risk of decay of the abutment teeth caused by a below satisfactory level of oral hygiene. Cognitive impairment makes denture-wearing almost impossible because of corresponding deficiencies in oral neuromotor function, such as chewing.[16] As degeneration continues, patients become increasingly unsuitable for dental work (**Table 2**).

Anticholinergics, antihypertensives, antihistamines, antipsychotics, anorectics, narcotic analgesics, anticonvulsants, antineoplastics, sympathomimetics, antidepressants, and diuretics, which are commonly used in patients with DAT from the earliest stages, all cause drug-induced xerostomia. Xerostomia is the major side effect of patients with early-moderate DAT, increases the rate of oral decay, and carries elevated risk for need of further dental treatment.[14-17] The symptoms of xerostomia include soreness or burning mouth, which manifests clinically as red inflamed mucosa,

Table 3

Computations of Subjective Fit (Fs) and Objective Fit (Fo)

	Patients with AD	Other dementias	Caregivers
Ps	13.50	13.50	18.25
	10.50	10.50	21.25
	10.00	10.00	18.25
	7.75	10.50	18.25
	11.00	11.25	18.50
mean	*10.55*	*11.15*	*18.90*
SD	*2.06*	*1.39*	*1.32*
Es	13.00	15.50	20.25
	14.25	17.25	20.75
	14.50	13.60	21.25
	13.00	14.75	19.50
mean	*13.69*	*15.28*	*20.44*
SD	*0.80*	*1.53*	*0.75*
T	0.025009	0.003847	0.077769
Fs=Ps-Es	-3.14	-4.13	-1.54
Po	-	-	-
	10.50	11.75	19.00
	18.00	13.50	19.00
mean	*14.25*	*12.63*	*19.00*
SD	*5.30*	*1.24*	*0.00*
Eo	12.00	11.00	21.75
	12.00	12.00	18.50
	15.50	14.50	21.50
mean	*13.17*	*12.50*	*20.58*
SD	*2.02*	*1.80*	*1.81*
T	0.699235	0.923767	0.226038
Fo=Po-Eo	1.08	0.13	-1.58

hyperkeratosis and atrophic and shiny tongue.[15] A decreased salivary flow rate leads to dry mouth when the salivary flow rate is less than the sum of the rates of water absorption and evaporation. As a result of xerostomia, root caries, mucositis, halitosis, and periodontitis develop at increased prevalence.[15-18]

A best-case study, that is to say a pilot systematic review, was conducted following the standard protocol outlined elsewhere.[19] The focus of the investigation of the best available evidence was to examine xerostomia as a side effect in the pharmacological intervention for patients with DAT. The overall search process revealed more than 14,000 published reports, and 21 remained following inclusion and exclusion criteria. The quality of the reports was examined by acceptable sampling, and when appropriate, meta-analysis examined overarching statistical significance. The number needed to treat (NNT) for the side effect of xerostomia was evaluated as described.[19] The consensus statement from this analysis indicated that the best available evidence supports xerostomia as a significant undesirable side effect from pharmacological treatment of DAT.

From Dentistry Based on the Evidence to Evidence-based Dentistry Pilot

In conclusion, the fundamental elements of dental practice for patients with DAT based on the evidence consists of the integration of the dentist's expertise, evidence of the patient's expressed needs and wants, and available published research. The authors have described simple in-house instruments that permit reliable evidence from patients with early-moderate DAT to be obtained. Feedback from the caregiver is needed only for patients with the more advanced stages.

The American Dental Association has described dentistry based on the evidence as that approach to dental practice that incorporates the elements of dentist's expertise, evidence obtained from the patient, and any relevant published report. It has contrasted that traditional approach to dental practice with evidence-based dentistry, which incorporates all the elements above with a systematic evaluation of the entire body of pertinent research. That

is to say, evidence-based dentistry consists of the integration of the traditional model of dental practice based on the evidence with the "best available" research evidence. In brief, guiding the model of evidence-based dental practice postulates that it is necessary and timely to improve quality of care by the utilization of efficacious methods, and by controlling or minimizing the elimination of the harmful ones.[13,19-21] This is particularly relevant for dental patient populations with special needs, such as patients with DAT. CDA

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Appendix: Conceptualization and Analysis of the Data Obtained From the Questionnaire

The precise quantification of coping and adjustment depends upon its articulated conceptualization. One successful effort in that domain has led to the definition of adjustment as the goodness of fit between the abilities of person and the demands of the environment: the person-environment fit.[10,11] According to this conceptualization, the construct of adjustment consists of two domains: the subjective fit, which represents the person's subjective evaluation of his or her own coping with the demands of the environment; and the objective fit, the real extent of the person's coping with the environmental demands. French and collaborators further demonstrate that subjective person-environment fit (Fs) is the result of the interdependent relationship between the person's subjective assessment of self (Ps) and his or her subjective evaluation of the environment (Es).[10] In a parallel fashion, the objective environment (Eo) and the objectively assessed person's abilities to meet its demands (Po) yield a quantification of the objective person-environment fit (Fo).[10,11]

These relationships are summarized quantitatively as Fo=Eo-Po and Fs=Es-Ps, and reflect the demand, or need on the part of the person (Np) or the environment (Ne) to actualize fit; and the given abilities of the person (Gp) or the given attributes of the environment (Ge) that facilitate fit. The objective person-environment fit (Fo) is a complex function of the difference (delta, Δ) between the attributes of the environment (Ge) and the need on the part of the person (Np) or the environment (Ne) to actualize fit. In the same vein, subjective person-environment fit (Fs) is a function of the delta between the attributes of the person (Gp) and the need of the environment (Ne) to facilitate fit.[10]

As stated in the text, the instrument was tested for reliability and was validated with three groups of subjects stratified among the groups of senile DAT, age-matched non-DAT dementias, and control subjects with no signs of dementia in the same age range. Subjects signed informed consent approved by the Institutional Review Board.

Summary descriptive statistics (mean and standard deviation, SD) were obtained across questions pertaining to the person's subjective assessment of self (Ps), the subjective evaluation of the environment (Es), the objective environment (Eo), and the objective assessment by the person's abilities to meet the

demands of the environment (Po). The normality and the independence of the Ps vs. Es data, and of the Po vs. Eo data were established and verified. Student t tests (or Wilcoxon non-parametric tests, when homogeneity of variance was violated) were used to establish the statistical position of the Ps vs. Es, and the Po vs. Eo means. The data were analyzed statistically (Analyze-It, version 1.72). The level of significance was set at α=0.05.

The data in **Table 3** indicate that the person's subjective assessment of self for patients with DAT (Ps: 10.55±2.06) was significantly lower than his or her subjective evaluation of the environment (Es: 13.69±0.80; p=0.03), which was reflected by a relatively large negative value for the computed fit (Fs: 10.55-13.69=-3.14). Similarly, patients with aging-unrelated dementias also showed a large negative Fs value, and significantly larger Es values compare to Ps (15.28±1.53 vs., 11.15±1.39; p=0.004). By contrast, the values of Ps and Es in controls were not significantly different (p=0.08).

Control subjects' perceived abilities to meet environmental demands (Ps) are less than the perceived environmental requirements (Es) (18.90±1.32 vs., 20.44±0.75; p=0.077) to an extent that would have attained significance, had the number of the items in the questionnaire dedicated to assessing Ps and Es been larger by two items. These data provide independent confirmation that the control group obtained for this study, which was composed of caregivers of patients with DAT or with non-DAT dementias, are under significant psycho-emotional stress and would benefit from counseling and training aimed at increasing the level of their skills for providing care to patients with DAT.

The data in **Table 3** present a similar analysis for the objective person-environment fit (Fo). Computations show that the abilities to meet demands of the surrounding environment (Po) and the objective environment (Eo) are essentially identical in both patients with DAT (14.25±5.30 vs., 13.17±2.02; p=0.70), and in patients with DAT-unrelated dementias (12.63±1.24 vs., 12.50±1.8; p=0.92). The values of Po and Eo in controls are also not significantly different (p=0.22).

The data further permit to contrast Eo and Es, and to quantify the construct of reality contact (Rc=Eo-Es) in the groups under study. In patients with DAT (13.17±2.02 vs., 13.69±0.80, p=0.70; Rc=-0.52), the subjective report of the attributes in reality given by the environment (Ge) was determined to be is satisfactorily accurate. In patients with DAT-unrelated dementias (12.50±1.80 vs., 15.28±1.53, p=0.078; Rc=-2.78), by contrast, the large difference between the objective environment (Eo) and the patient's subjective assessment of the environment (Es) unmasks a clinically important disjointed evaluation of environmental demands. Control subjects manifest strong reality contact (20.58±1.81 vs., 20.44±0.75, p=0.88; Rc=0.14).

These analyses indicate that both patients with DAT and patients with DAT-unrelated dementias perceive themselves as substantially inadequate to face the demands of their environment, as they perceive it. Reminiscent of the assessment of self-concept, these analyses of fit as a function of Ps and Es provide a grasp of the patients' perception of the environment as well as the perception of themselves. Both patients with DAT and patients with DAT-unrelated dementias view themselves as ill-equipped to face the challenges they perceive in their surrounding environment. The analysis of subjective fit (Fs) delivers to the clinicians the view of the patients' perception of his or her given (Gp) abilities to face the needs and the demands of the environment (Ne).

That patients with mild-to-moderate DAT perceive to lack the necessary coping skills to be well-adjusted in their present environment, as evidenced by this P-E fit analysis, is an important piece of evidence in assessing the patients' ability to relate to the dentist his or her dental needs and wants. The analysis of the objective sense of fit (Fo) reveals that the objective person-environment fit in both two populations of patients under study, as well as the controls, does not deviate appreciably from 0. This outcome indicates that, within their present life situation, the attributes given by the environment (Ge) do not greatly diverge from the need on the part of the person (Np) to actualize and optimize adjustment and fit. This evidence suggests that patients with early-moderate DAT are capable of recognizing the benefit their environment (i.e., home, dental office), and can provide them with respect to their dental needs.

The quantification of the construct of reality contact (Rc=Eo-Es) confirms that patients with DAT accurately assess the demands of the environment, but recognize themselves to be inadequately equipped to fulfill them. Patients with DAT-unrelated dementias harbor an altered contact with reality, that when coupled with their estimation of being ill-equipped to meet the demands of the environment, suggests that dental intervention cannot rely on the evidence for needs and wants provided by these patients. When designing dental treatment interventions for patients with DAT-unrelated dementias. Dentists should rely on the information provided by the caregivers, not the patients. This analysis indicates that this is not the case for patients with mild-moderate DAT, who show as strong reality contact as control subjects.

With respect to the accuracy of self-assessment (As = Po-Ps), the data in **Table 3** reveals that the person's actual abilities to meet environmental demands (Po) is greater, albeit not statistically significantly, than his or her subjective assessment of self (Ps) patients with DAT (14.25±5.30 vs., 10.55±2.06, p=0.48; As=3.70), and in patients with DAT-unrelated dementias (12.63±1.24 vs., 11.15±1.39, p=0.32; As=1.48). Controls also have unwavering accuracy of self-assessment (19.00±0.01 vs., 18.90±1.32, p=0.99; As=0.1).

Diminished well-being and impaired awareness of self and one's own abilities among patients, as revealed by the analysis of this questionnaire, are important pieces of evidence for clinical diagnosis, which permit from the evidence presented by the patients, to that offered by the caregiver in order to maintain firmly the precepts of dental practice based on the most accurate evidence. This evidence provides a critical element for the psychiatric interventions following the customary clinical practice guidelines.[1,2,4,10]

Because of the simplicity of the questionnaire, it can be administered reliably at every follow-up visit. In this manner, the dentist can monitor the progress of the dementia, and optimize intervention. Dentists can evaluate the delta change (Δ) over time during treatment obtained, and a ΔFo will indicate changes in actual coping abilities, and a ΔFs will quantify perceived adjustment. Change in the mastery of the patient under treatment with respect to the handling the demands of the environment (Ne) will be quantified as ΔEo, and ΔEs will signify change in mastery in the person's needs (Np) to handle the environment. Similarly, ΔPo will give the change in the person's skills to actualize fit, and ΔPs will represent changes of the patient's self-concept. CDA

Evidence-based Practice of Oral Pathology and Oral Medicine

Lewis Roy Eversole, DDS, MSD, MA

ABSTRACT

Oral pathology is the specialty area of dentistry that deals with the diagnosis and management of oral diseases and more specifically, diseases other than dental caries, periodontal disease, restorative dentistry, and orthodontic therapy. Oral medicine represents the clinical arm of oral pathology and deals with diagnosis and treatment of soft-tissue lesions, whereas oral histopathology is the specialty area that focuses on the microscopic diagnosis of soft- and hard-tissue lesions of the head and neck area. The diagnosis and treatment of oral pathologic conditions is often based on empirical decision-making and many approaches to treatment have not been well-supported by clinicopathologic studies. The need for evidence-based, scientifically documented approaches to both diagnosis and treatment is eminent. Specific diagnostic criteria are lacking for many oral diseases, and therapeutic strategies have not been assessed by the gold standard of placebo-controlled, double-blind trials. Additionally, there are scientific data in the published literature that continue to be ignored by dental practitioners who manage patients with oral pathologic conditions. In this article, specific disease entities that are commonly managed by oral pathologists and oral medicine practitioners will be discussed with recommendations for future scientific studies that can serve as a framework for evidence-based diagnostic and therapeutic approaches.

Oral and maxillofacial pathology is the specialty area of dentistry that is limited to the diagnosis of oral, head, and neck diseases. In addition, many (yet not all) oral pathologists manage and treat diseases of the oral mucosa, whereas jaw diseases are typically managed by oral and maxillofacial surgeons. In Canada, oral medicine is considered to be a separate specialty of dentistry, distinct from oral pathology, whereas in the United States, oral medicine has not attained specialty status. Nevertheless, there are many competent, dentists who practice oral medicine in the United States and have received advanced training in this area of dentistry. Additionally, other specialists also manage oral mucosal diseases, particularly periodontists.

This article will discuss evidence-based practice from two viewpoints: First, the clinicopathologic diagnosis of oral disease, and secondly, the clinical management of soft-tissue diseases of the oral cavity and perioral regions. Histopathologic diagnosis has always been considered an art and a science because many lesions do not have abso-

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CERTAINLY THERE MAY BE MORE THAN ONE OPTION AVAILABLE FOR TREATING ANY GIVEN DISEASE, AND IT IS AXIOMATIC THAT A THERAPEUTIC APPROACH THAT YIELDS A SATISFACTORY OUTCOME FOR ONE PATIENT MAY NOT BE EFFECTIVE FOR YET ANOTHER.

lute diagnostic criteria or the criteria are veiled. In yet other instances, diagnostic criteria are well-defined and substantiated. Oral and maxillofacial pathologists enter into the decision-making process every time a microscopic slide is evaluated; the ultimate diagnosis is based on cell differentiation, basic pathologic processes as seen microscopically and cytologic features of cells within a lesion. Prognostication is based upon published studies that assess lesions with identical or similar microscopic patterns in which follow-up data have disclosed outcomes that are predictable. This is particularly true concerning neoplasms. There remain many oral diseases in which diagnostic criteria are vague or overlapping and numerous publications attest to the fact that inter- and intra-rater reliability indices are low.

With regard to clinical management strategies, be they pharmacologic, surgical or psychotherapeutic, there are many approaches that are evidence-based, backed by reliable outcome data. However, there are many more that are entirely empirical and have no scientifically substantiated validity. Practitioners often select varied therapeutic approaches for the same disease entity without any standardized selection criteria. Certainly there may be more than one option available for treating any given disease, and it is axiomatic that a therapeutic approach that yields a satisfactory outcome for one patient may not be effective for yet another. Importantly, there are very few data that address such circumstances.

Evidence-based Research in Diagnosis and Treatment of Oral Pathoses

The diseases that are diagnosed microscopically are numerous and protean. Some are quite common; others are so rare that a pathologist may render a diagnosis of such an entity only once or twice in his or her career. The rarities require anecdotal accounts since there are not enough cases to generate a compilation of statistically robust data. These rarities will not be considered here; rather, will concentrate on the more common and clinically significant disease process for which evidence-based criteria may be obtainable. **Table 1** lists the disease entities that are commonly assessed by oral and maxillofacial pathologists with indications as to whether the literature provides evidence-based diagnostic criteria or not. **Table 2** lists the diseases for which therapeutic strategies are based upon scientific data or not. Due to the scope of this communication, only four of these pathologic conditions will be discussed and documented with citations from the literature.

There have been many publications that have detailed the histopathologic criteria for head and neck tumors, defining so-called classic criteria and histologic variations that may be encountered for a given diagnostic category. Tumors with similar histologic patterns have been grouped as case studies and long-term follow-up analyses have compared and contrasted therapeutic approaches, usually surgical, sometimes radiation therapy. Kaplan survival curves yield reliable data that compare and contrast various treatment modalities for any given tumor in a specific anatomical location. From **Table 1** it is evident that most head and neck neoplasms have been assessed in this fashion and treatment outcomes can be predicted. This data appears in a variety of publications that have been documented in the literature over the past 30 years, providing surgeons, radiotherapists, and chemotherapists with appropriate therapeutic protocols. Arguing against the evidence-base is the fact that diagnostic inter-rater and intra-rater reliability correlation analyses among pathologists, at least for some tumors, is not always robust.[1-4] In this context, the advent of immunohistochemical, IHC, marker studies has improved reliability for diagnostic accuracy for many tumors with equivocal microscopic patterns.

Another factor that bodes ill for diagnostic accuracy and reliability in pathology is nosologic designation.[5-7] Many neoplasms have been reclassified based on new IHC findings or molecular pathobiological gene expression data, and these new classifications may

Table 1

Commonly Encountered Oral Diseases of the Oral Cavity and Jaws

Assessment of evidence-based diagnostic criteria from published data

Disease entity	Evidence-based criteria
Salivary gland tumors	Yes
Connective tissue tumors	Yes
Epithelial tumors, benign	Yes
Epithelial tumors, malignant	Partial
Fibro-osseous lesions of the jaws	Partial
Odontogenic tumors	Yes
Odontogenic cysts	Yes
Epithelial dysplasia	No
Lichen planus/lichenoid reactions	No
Neuralgia-inducing cavitational osteonecrosis	No
Atypical facial neuralgia	No
Vesiculo-bullous and immunopathologic diseases	Partial
Infectious diseases (specific)	Yes
Reactive proliferations	Yes
Sarcomas	Partial
Metabolic diseases of genetic origin	Yes

be confusing to clinicians who have for years relied upon previously established classification schemata. A case in point is the neoplasm malignant fibrous histiocytoma. Many pathologists have recently presented research findings that deny the presence of such an entity. Many reports have detailed the features of this tumor, along with treatment outcomes, and now clinicians are told that such a tumor is nonexistent. So problems continue to surface, but for the most part, diagnosis and treatment of the vast majority of neoplasms is evidence-based.

In this communication, four diseases have been selected in which diagnostic and therapeutic criteria have been forwarded; however, sound scientific data fail to support a commonly accepted criterion standard. Again, referring to **Table 1**, the author would like to address oral epithelial dysplasia, lichen planus, atypical neuralgia and neuralgia-inducing cavitational necrosis of the jaws. These four entities are commonly reported in the dental and medical literature and diagnostic criteria have been established for many years. Nevertheless, there are significant pitfalls with these criteria with resultant obfuscatory features that affect sound treatment plan decision-making.

Oral Epithelial Dysplasia

Dysplasia is a histopathologic change that putatively identifies cytologic changes that are predictive for progression to carcinoma. The established criteria for dysplasia of the oral mucosa were derived from cytopathologic changes as identified in cervical epithelial dysplasias, also referred to as cervical intraepithelial neoplasia. In the cervix, dysplasias have been graded as low, moderate, and severe. These are all preinvasive lesions with mild dysplasias showing atypical cytologic change in the lower strata of the epithelium, moderate dysplasia involving lower- and mid-spinous level atypia, severe dysplasia involving most layers of the epithelium, and carcinoma in situ affecting all layers with atypical cytologic features. These same criteria have been applied to oral dysplasias (oral intraepithelial neoplasia); however, there are conflicting data indicating that low-grade dysplasias carry a lower risk for progression to invasive squamous cancer than do high-grade lesions. In some studies, dysplastic leukoplakias have been shown to carry a higher risk for progression to invasive cancer than lesions without dysplasia.[8] There are additional data that indicate oral dysplasias have a high risk for progression to carcinoma, however, not all dysplastic lesions follow such a course.[9,10] Intuitively, pathologists have assumed that escalating degrees of dysplastic severity in an oral lesion portend a worse prognosis and a higher risk for cancer progression. Such a notion has recently been challenged in studies that indicate the degree of dysplasia severity does not serve as a predictor for carcinomatous transformation. Indeed, even non-dysplastic oral keratotic white lesions have been shown to undergo progression to carcinoma.[11,12]

Recent studies have explored the use of biomarkers that target protein and gene expression within oral leuko- and erythroplakias; such markers include cyclins and other cell cycle proteins, growth factor receptors and signal transduction enzymes. The two

most important markers identified so far are ploidy analysis (i.e., DNA content assessment of biopsy material) and computerized image analysis.[13-17] Abnormal DNA content, aneuploidy, has been found to be an important predictor of progression to cancer from leukoplakias while, as previously mentioned, microscopic assessment of degree of dysplasia does not. The second predictor is a compilation of nuclear morphologic parameters that are evaluated by computer image analysis yielding an index pattern that predicts progression to cancer. A clinical biomarker, the vital dye toluidine blue, has been shown in one study to predict a poor prognosis when the dye is retained in the tissues after painting the lesion.[18] Further confirmatory studies are needed to substantiate these new findings, and in the future, surely other biomarkers will be identified that may prove to be of prognostic value.

What about the treatment of dysplasia? Certainly if dysplasias as a group carry a risk of progression to cancer in nearly 40 percent of cases evaluated with a mean follow-up period of five years, then wide excision should prove to be an effective approach to removal of atypical cells, abrogating progression to invasive carcinomas. Disappointingly, this has not been born out in the literature. In fact, there are studies that indicate that the progression of a precancerous lesion into cancer is the same whether a dysplastic lesion has been excised (treated) or simply subjected to a incisional biopsy without further intervention (untreated).[12] So one could reasonably take the position there is no reason to remove dysplasias since some of them will progress to cancer whether they are treated of not. Therefore, additional research is required to answer this perplexing and enigmatic outcome. Were the excised specimens assessed for margins? Could the margins appear to be cytologically normal as assessed by the pathologist, yet still harbor genetic lesions that are not yet identifiable by current technological assays? Are there topical chemotherapeutic drugs that could be applied to tissues outside the diameter of lesional excisions that could reverse the early molecular events of neoplasia? Until these questions are addressed and analyzed, evidence-based approaches to treatment will remain lacking.

Table 2

Commonly Encountered Oral Soft-Tissue Diseases of the Oral Cavity

Assessment of evidence-based clinical therapeutic criteria from published studies

Disease entity	Evidence-based criteria
Herpes virus types I and II	Yes
Candidiasis	Yes
Leukoplakia	Partial
Oral dysplasia	No
Lichen planus	Partial
Mucous membrane pemphigoid	Yes
Pemphigus vulgaris	Yes
Allergic stomatitis	Yes
Aphthous stomatitis	No
Burning mouth syndrome	No
Atypical facial neuralgia	No
Dysgeusia	No
Proliferative verrucous leukoplakia	No
Focal epithelial hyperplasia	Yes
Connective tissue hyperplasias/reactive proliferations	Yes
Benign connective tissue neoplasms	Partial
Geographic tongue	No
Erythema migrans	No
Median rhomboid glossitis	No
Metabolic diseases	Yes

Oral Lichen Planus

Lichen planus is a common dermatologic disease that affects approximately one in 200 people.[19] It is found worldwide affecting almost every ethnic group. Interestingly, when lichen planus evolves on the skin, the lesions persist for less than one year and ultimately resolve. In oral mucosa, most patients take their lichen planus to the grave. The microscopic criteria for this disease of unknown etiology are well-established and immunological studies con-

firm that the lesions are a T lymphocyte mediated response to antigens (planted antigens, contact antigens, autoantigens) in the overlying epithelium.[20] It has also be documented that lichen planus lesions of both skin and oral mucosa may be caused by a variety of systemically administered medications, although the vast majority of cases are idiopathic (or the clinician has been unable to identify an antigenic source).

Dental restorative materials have been documented to be a cause of lichen planus-like lesions (lichenoid) in the oral mucosa, particularly, old corroding amalgams. These lichenoid white patches have been referred to as "contact lesions" and in most, allergy skin testing has documented delayed hypersensitivity responses to mercury although other metals have been implicated less often. Removal of the old filling material results in eventual resolution of the lesions.[21,22]

Diagnostic criteria for oral lichen planus can be blurred by more recently described pathologic processes that manifest overlapping microscopic features. Cinnamon is allergenic for some subjects, and will induce red, white, and ulcerative lesions that can mimic oral erosive lichen planus although evidence-based studies have, in fact, shown that cinnamon reactions exhibit lichenoid features, yet also contain perivascular lymphoid aggregates in the submucosal connective tissues. Poignant questioning and antigenic dietary elimination will often confirm the diagnosis.[23]

Leukoplakias may also present with a histopathologic lichenoid reaction and when cytologic atypia is seen, such lesions may be referred to as lichenoid dysplasias.[24] Are these instances of lichen planus that are undergoing carcinomatous transformation? Or, are they precancerous leukoplakias that manifest a delayed hypersensitivity reaction to neoantigens expressed during molecular events that lead to dysplasia? Malignant transformation among patients with lichen planus has been reported to be about 1 percent, certainly far higher than that in the general population.[25-27] So, there is no clear-cut criteria to separate these two entities, if in fact they are separate.

Lastly, lichenoid lesions are commonly seen among patients who do not exhibit the classical stria of Wickham. They may be seen in isolated as well as multifocal lesions and microscopically exhibit a chronic interface lymphocytic mucositis, essentially identical to that of lichen planus. So, it is evident that a variety of lesions share microscopic and clinical features identical to, or at the least, consistent with, lichen planus. Reliable diagnostic criteria are of utmost significance, since therapy is predicated upon an accurate diagnosis. There is still much to be learned about these T cell mucositides, and as with dysplasias, biomarkers will probably play an increasingly important adjunct to diagnostic refinement.

Evidence-based studies on treatment for lichen planus have been well-documented in the literature, corticosteroids being most effective.[28-31] Even so, there are many patients that respond poorly or not at all to both topical and systemic steroids. Perhaps these response disparities can be attributed to the lack of aforementioned confusion over diagnostic criteria for this disease. There are publications that attest to the effectiveness of tacrolimus and cyclosporine topical or mouth rinse preparations in oral lichen planus.[32-39] Combination multiagent therapy has not been evaluated in controlled trials.

Atypical Facial Neuralgia and Neuralgia-inducing Cavitational Osteonecrosis

Facial pain diagnosis has been an ongoing enigma. The criteria employed for specific or typical neuralgias is well-supported by evidence-based studies.[40] Of course, facial pains are commonly subsumed under the organic pathogenetic categorization of infection/inflammation to include: dentoalveolar abscesses, periodontal abscesses, and osteomyelitis. Sialogenic, neuromuscular, TMJ arthralgiac, and vasoactive pain syndromes of the head and neck also possess a discrete pattern of features that allow for a definitive diagnosis when specific clinical, imaging and microscopic characteristics are uncovered. The literature is replete with documentation of diagnostic criteria and therapeutic interventions. When none of these diagnostic criteria are evident in the facial pain patient, then by exclusion, the term "atypical facial neuralgia" is applicable.[41-44] In essence, patients who fall into this group represent a population of facial pain patients for which there is no pathophysiologic basis for their pain. Psychosomatic mechanisms have been touted as etiologically relevant, and some credence is provided by studies that have indicated successful response to treatment with psychotropic drugs, particularly antidepressants.

Notably, antidepressant serotonin reuptake drugs may have pain attenuating properties unrelated to psychological effects.[45] There is no extant theory that justifies a psychogenic causation, and for now, it can be assumed that a psychopathologic mechanism for atypical facial pain is merely a hypothesis.

Ratner and colleagues first implicated an organic lesional origin for atypical pain in a series of publications that proposed the pain symptoms could be attributed to gnathic intraosseous cavitations.[46,47] He hypothesized that atypical jaw pains were due to necrotic foci in the jawbones and that surgical intervention could be curative. Furthermore,

such lesions were not evident on dental radiographs and could only be detected by injection of local anesthesia in the region of pain symptoms. If the administration of local anesthetic alleviated the pain, surgery in the area would uncover a vacant marrow space (bone hole), and curettage would relieve the pain symptoms.

This theory was further promulgated by Bouquot and colleagues who applied the appellation "neuralgia-inducing cavitational osteonecrosis" or NICO.[48-50] They proceeded to corroborate Ratner's hypothesis and also proposed that a subset of patients with NICO suffered from an underlying thrombocyte disorder.[51] Additionally, histopathologic criteria for the diagnosis of NICO have been published by Bouqout et al. in which bone necrosis and accompanying microscopic changes touted to be diagnostic for NICO have been detailed.

There are others who vehemently oppose the concept of NICO.[52,53] Surgical interventions have been reported to be ineffective and the entire conceptual framework of pathogenesis has been questioned. Herein lies an important precept in the assessment of the scientific literature. Published results from a single center, without corroboration from other clinics or laboratories should not be taken as evidence-based documentation until other centers are able to substantiate or support the findings. In the histopathologic assessment of NICO, it is noteworthy that normal edentulous jaw sites among patients without pain symptoms have never been included as a control group.

Summary

An overview of various oral pathologic entities has been reviewed with regard to extant evidence-based clinical and histopathologic criteria for diagnosis and decision-making for therapeutic interventional strategies. A broad spectrum of oral diseases has been evaluated in the literature (not cited here due to the restricted scope of this communication), some empirically, others using scientific methods with control groups. Many yield evidence-based criteria for accurate reliable diagnosis and yet, others show documented support for sound therapeutic strategies. Those that do not have a robust scientific basis require further sturdy, using the principals of the scientific method.

Four oral pathology/oral medicine diagnoses have been singled out for more detailed assessment since they represent either common diseases or diseases with controversial diagnostic and therapeutic criteria. Oral epithelial dysplasia is a histopathologic entity that has always been considered precancerous and is typically detected on biopsies of leukoplakias and erythroplakias. The diagnostic criteria appear to be evidence-based when distinguishing dysplasia form benign keratosis; however, gradations of dysplasia among pathologists are not reliable: neither intra- nor inter-relater reliability correlation coefficients are robustly significant. Emerging evidence teaches that molecular biomarkers are more reliable than histopathologic grading of dysplasias concerning prediction for progression from a precancerous lesion to invasive carcinoma.

Lichen planus is a common oral disease with both clinical and histopathologic criteria for diagnosis. Studies have disclosed that these criteria are not always applicable and hence, a diagnosis of "lichenoid reaction" is rendered when diagnostic criteria are not classically present. The term "chronic interface mucositis" is often applied by pathologists when the clinician does not provide a history of classic clinical findings such as stria of Wickham. Is lichen planus a disease unto itself, or is it merely a T cell mediated hypersensitivity reaction to a plethora of as of yet unidentifiable antigens or autoantigens? Clinically, lichen planus, as well as lichenoid reactions, respond to topical anti-inflammatory agents, yet treatment outcomes can be quite varied among a cohort of affected patients.

Facial pain syndromes include a miasma of clearly defined entities with precise diagnostic criteria in contrast to another group who suffer from vague, poorly understood symptomatologies. Atypical facial pain is a "wastebasket" term for jaw pains that do not conform to a specific or classic form of facial pain such TMJ arthritis, TMJ internal derangement, stress-induced myalgia, trigeminal neuralgia, or cluster headache. The pathophysiology is poorly understood and the diagnostic criterion is one of disease entity exclusion. Many atypical facial neuralgias have been subsumed under the diagnosis of neuralgia-inducing cavitational osteonecrosis, an entity not accepted by many experts in the field. Clearly, evidence-based diagnostic criteria and therapeutic interventions require focused attention where idiopathic facial pain is concerned. Patients suffer considerably from this category of facial pain syndromes and for most, no relief has been forthcoming.

Erratum: During the writing of this manuscript, the veracity of data provided by Sudbo et al. has been called to question by the Norwegian government and by the journals in which his data was published.[12,15-17] This offers another lesson in diligence when assessing the literature for evidence-based information and reemphasizes the necessity for evaluating data from the findings of more than one author or institution. CDA

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Robert E. Horseman, DDS

It's Not Ruff Detecting Caries

You'll never guess what Philip Davoyd is doing now.

"Flip," as he came to be known early in his freshman year when he dared to continually challenge existing shibboleths of the Operative Department, was the environmentalists' poster boy. But that came later. When he expressed his opinion in class that "extension for prevention" was a blight on humanity and that G.V. Black was, at best, an impoverished charlatan, we thought he had *flipped*, thus the sobriquet.

Flip is convinced that X-rays, once they have passed through cheek, tooth and bone, do not obligingly disappear.

Flip somehow managed to graduate, having intimidated the faculty with threats of discrimination lawsuits, and went on to establish new landmarks in innovative dentistry. You will recall his failed attempt to operate in a vacuum, and the time when he unsuccessfully sued the Edison Company for what he perceived as "contaminated electricity."

His refusal to pay his bill unless he was supplied with "direct" current, maintaining that "alternating" current was the company's illegal scheme for sending out and rapidly retrieving the same electricity over and over, charging for it each time. He lost in federal court where the presiding judge characterized it as a classic example of "gaudiamus igatur loco cabasa" (literally, a frivolous nut case).

Undeterred, he joined a group of militant tree-huggers and had a series of monogamous relationships with a sequoia gigantia, a larch, and a pair of Monterey pines. He finally settled down with a stunning Morton fig tree, finalizing the union with a somber ceremony officiated by a Druid priest operating a mail-order chapel out of Stonehenge, England.

News from Flip's world has been con-

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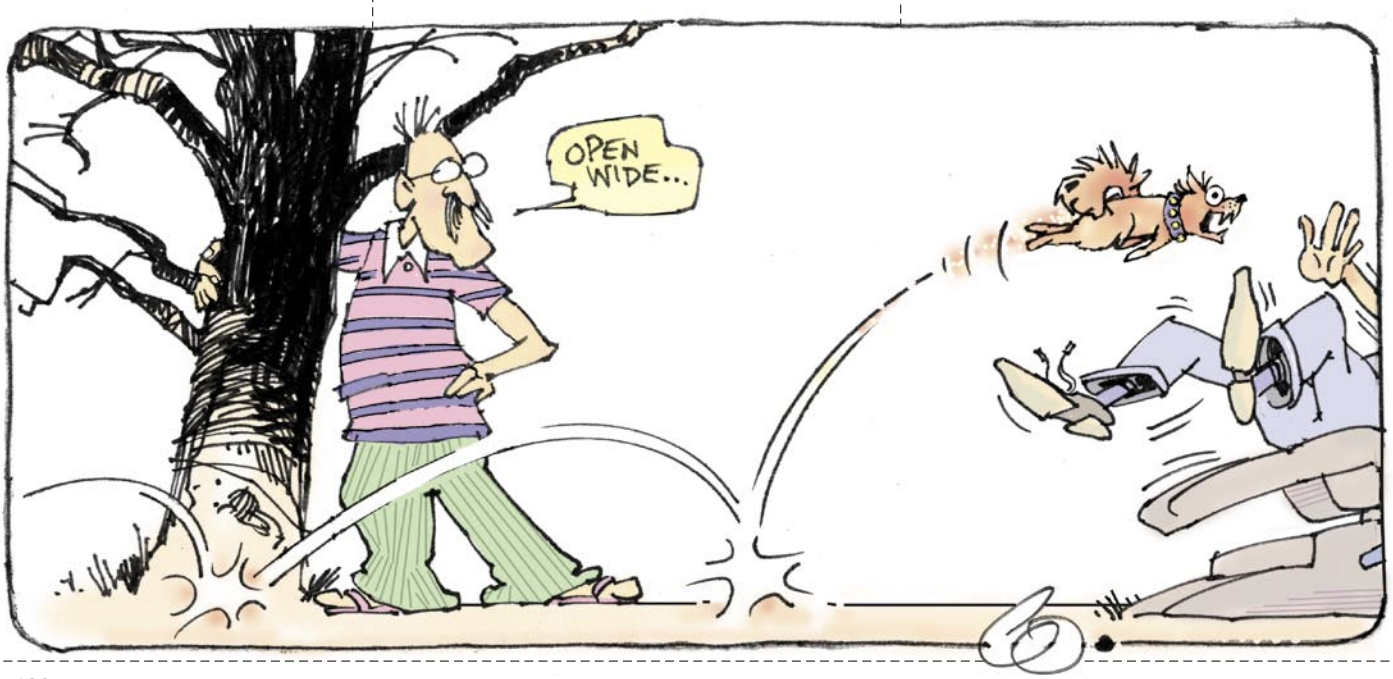

Flip's reasoning — and this is hard to dispute — is that if a dog can be trained to detect minute amounts of cocaine, heroin and pot, he can be taught to detect caries.

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spicuous by its absence until just the other day. Apparently, he has become obsessed with the idea that radiation, particularly dental X-ray radiation, is going to be our undoing. Flip is convinced that X-rays, once they have passed through cheek, tooth and bone, do not obligingly disappear. They are still out there, he maintains, and they are accumulative. This means that every single one since Roentgen's early experiments is milling around in the atmosphere, and they are the culprits responsible for destroying the ozone layer, not the aerosol in your hairspray.

Not one to sit idly by awaiting certain doom with bovine placidity, Flip has junked his dental X-ray and replaced it with Achtung. Achtung is a retired German shepherd, formerly employed by the Drug Enforcement Administration. As a drug-sniffing agent, Achtung had no peer until he developed an allergy to Samsonite, whereupon his career had to be terminated. That's where Flip found him, in a holding pen at the local pound boring the dewclaws off the other dogs with tales of his derring-do in south Florida drug busts.

Flip's reasoning — and this is hard to dispute — is that if a dog can be trained to detect minute amounts of cocaine, heroin and pot, he can be taught to detect caries. Even a dental student can be taught to recognize caries, although it takes four years and confusion often results with artifacts such as the mental foramen.

Not so with Achtung. As we understand it, he places his paws on the patient's chest, thrusts his nose directly into the open mouth and announces his findings in no uncertain terms with violent tail wagging and enthusiastic salivating. Since Achtung's muzzle is large enough to cover an entire quadrant, Flip quickly discerned the need to get a more specific diagnosis as well as placate those few patients who bristled at having a 150-pound animal astride them.

Enter "Archie" (full name Archie Wawa), the office auxiliary and emergency backup dog. Archie is 16 ounces of caries-detecting precision. On the command "Yo quiero caries?" he will quickly conduct a full-mouth examination, pausing briefly at each tooth to wag his tail twice for "si" and once for "no." Unfortunately, as with many small dogs, Archie can sometimes lapse into what has been termed the "Excitement Dance of Wee-wee" during the drama of the examination. Once Flip has convinced Archie there will be no big payoff for finding cavities beyond the obligatory half a Milk-Bone, he feels his canine X-ray replacement will outgrow his excitement phase like the rest of us did, and all will be well.

Philip Davoyd, alongside of whom Prince Charming is an ignatz, is not resting on his laurels, or his maples, or oaks for that matter. Do not be surprised if sometime soon he has manipulated genetic engineering to the point where we can eliminate the patient altogether. CDA